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MARCH 1943

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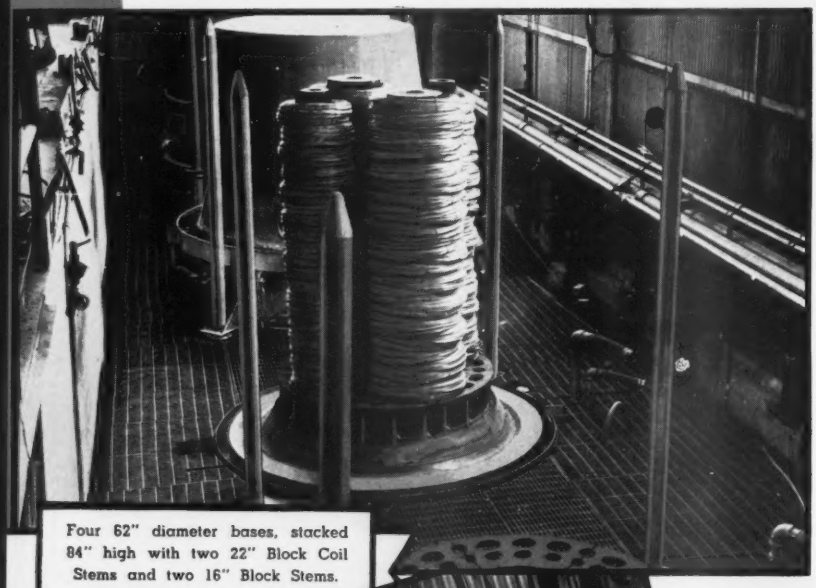

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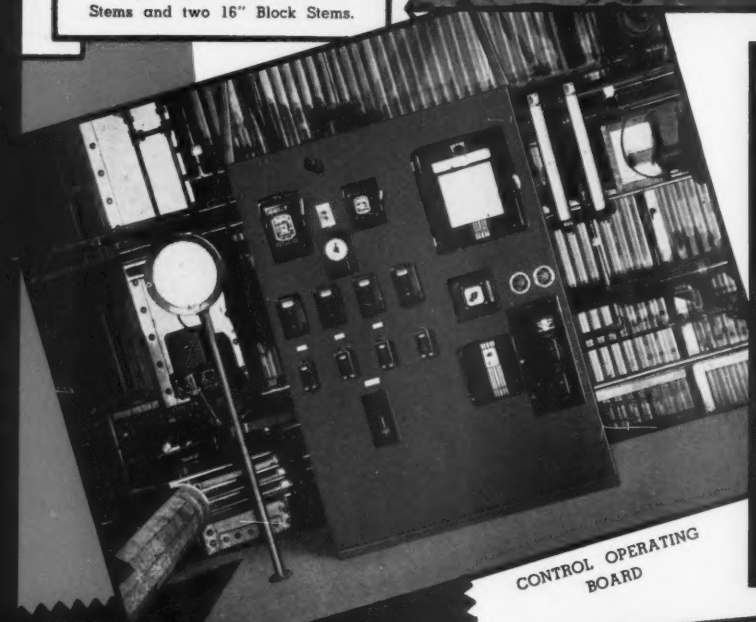

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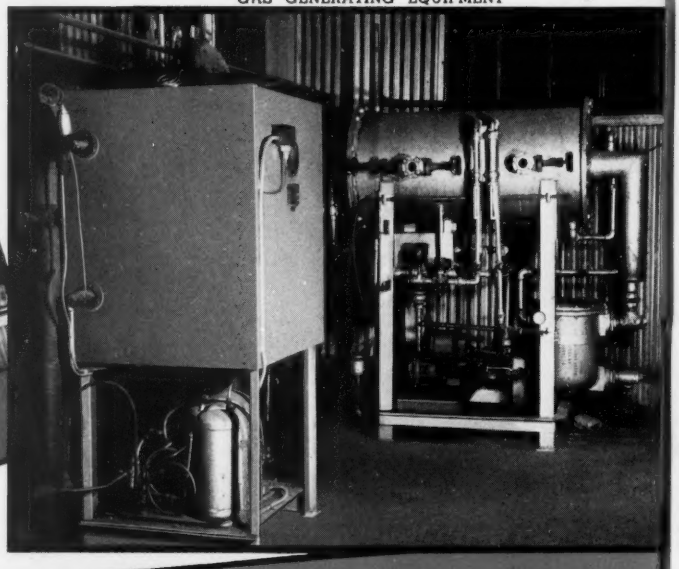

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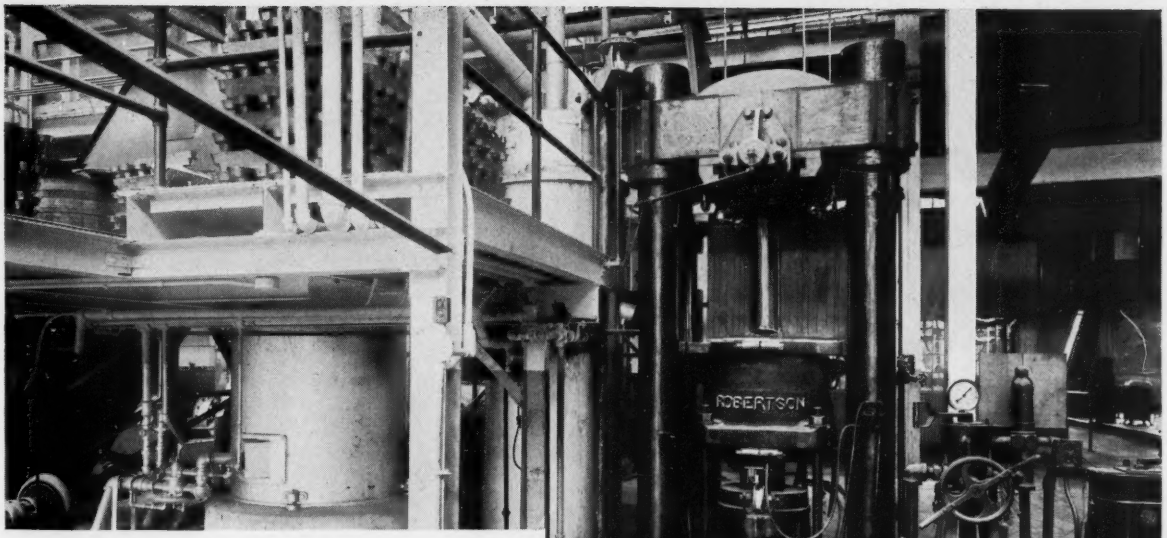

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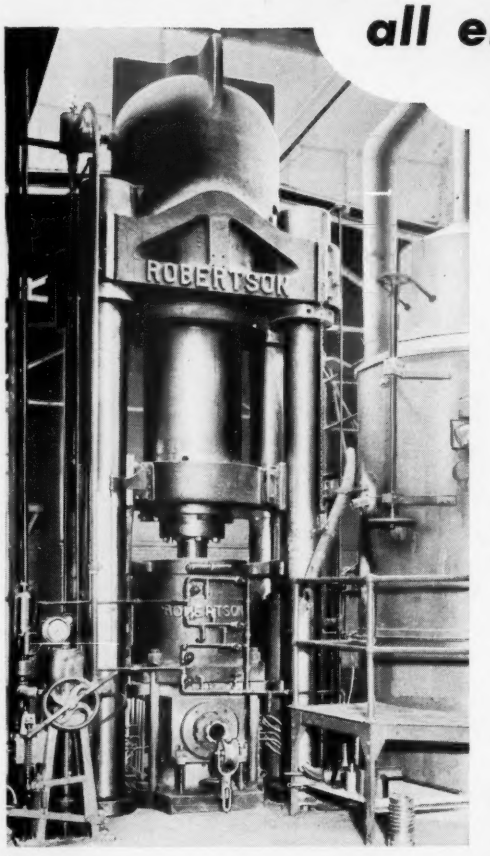

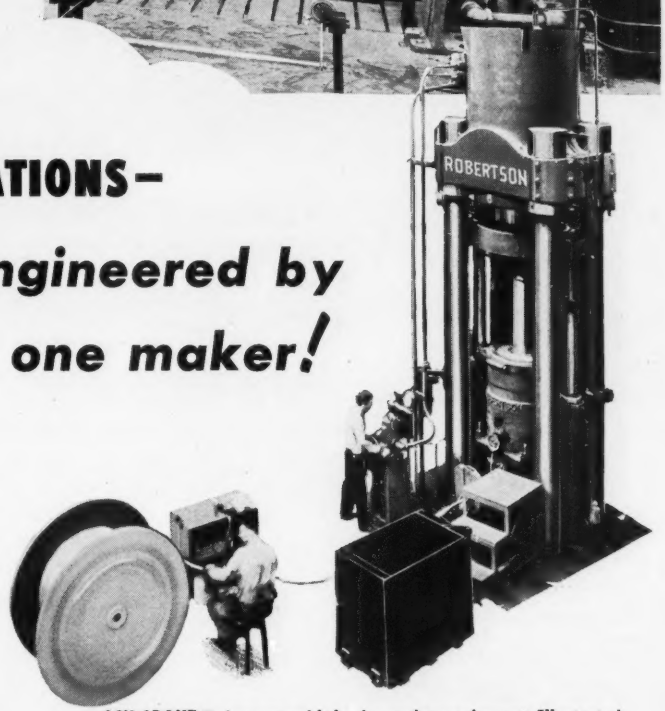

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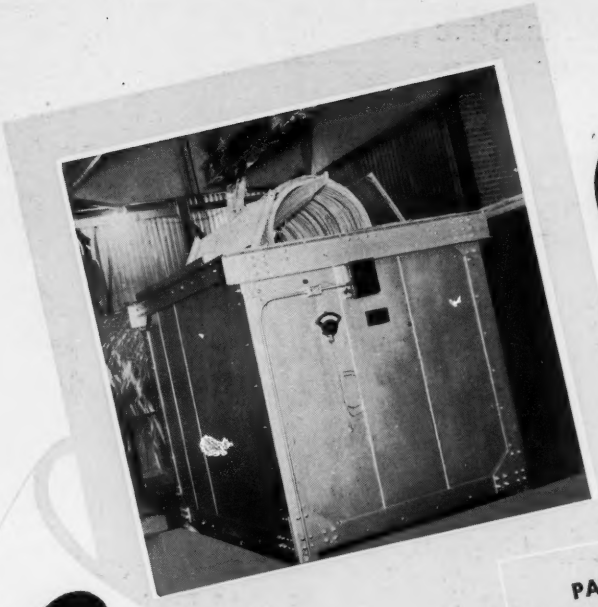

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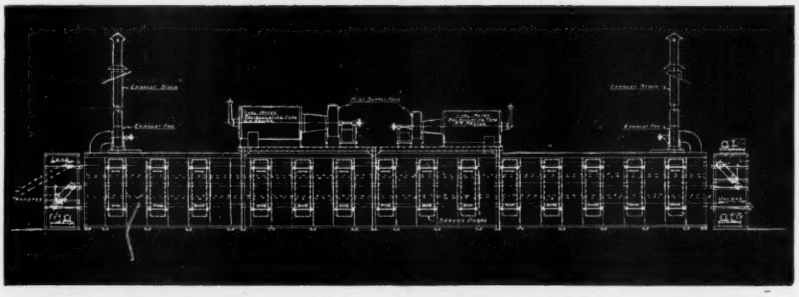

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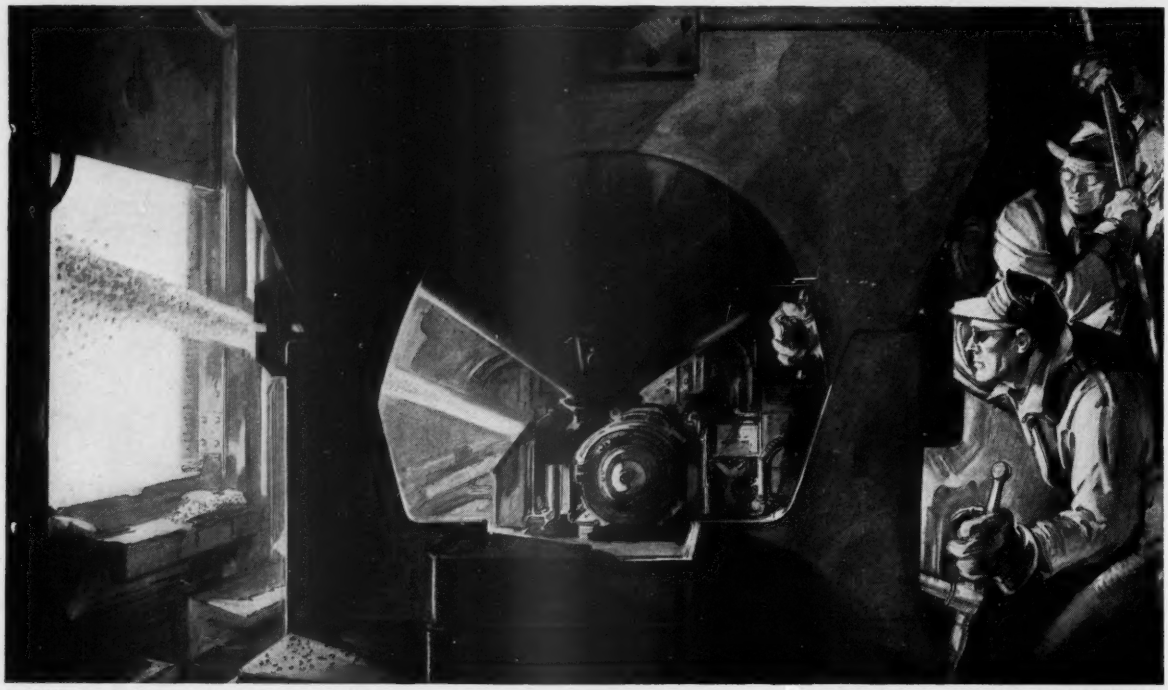
By being watchful over many things, J&L men are producing more steel for war



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FROM AN ORIGINAL DRAWING BY ORISON MACPHERSON

DOLOMITE GUNS IN ACTION AT OPEN-HEARTHS HELP MAKE RECORD WAR-STEEL PRODUCTION

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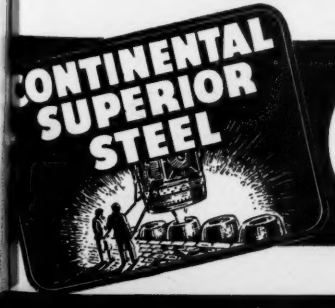

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W-83

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WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 18 MARCH, 1943 No. 3

Designated as

Official Publication By The Wire Association

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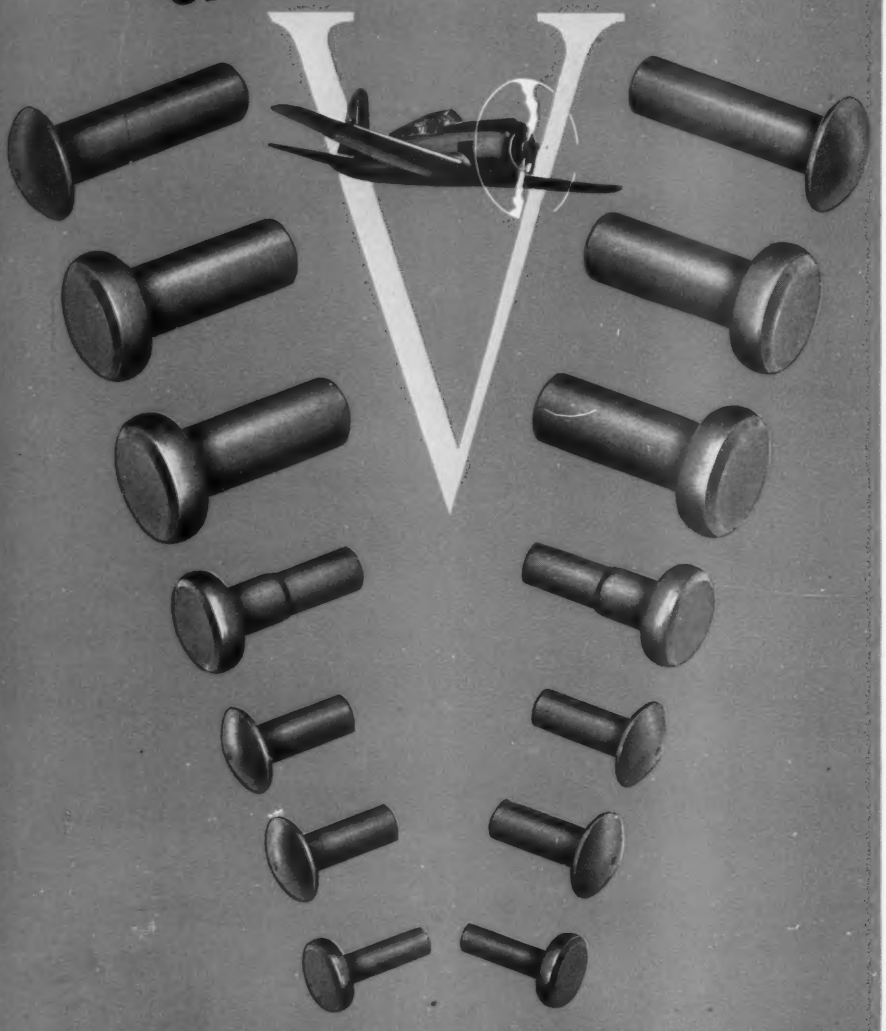

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Put an end to complaints and rejections because of "poor fit." Switch to Firthaloy Cold Heading Dies. Then, all your bolts and rivets will fit—and close army-navy specifications can be held.

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WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip.
Wire Products and Insulated Wire and Cable.
DRAWING --- ROLLING --- EXTRUDING --- FORMING --- FABRICATING

Vol. 18 MARCH, 1943 No. 3

Relative Workability of Metals

By A. G. H. Andersen,
Metallurgical Engineer, Oakdale, N. Y.

A new approach to the problem of stresses involved in the deformation of metal by wire drawing, somewhat complicated by ignoring die friction. ✦ ✦ ✦ ✦

THE energy required to deform metals, under standard conditions may be used as a measure of workability.

✦ ✦ ✦

OF the various methods of cold working metals, drawing, or extruding through dies, are practically free from external bending moments and are therefore not unduly complicated by the effect of bulk.

✦ ✦ ✦

THE energies of deformation are most readily obtainable in the case of wire or rod drawing, the process of which is the subject of the present investigation.

✦ ✦ ✦

LET E = energy, Lb in/in^3 required to deform 1 in^3 of metal; P = deforming force, or pull; p = pull as Lb/in^2; D = diameter, and A = cross sectional area of drawn rod. Then 1 in^3 of metal yields a rod of length L = 1/A; the energy required to deform 1 in cube of metal from diameter D_{n-1} to D_n is E = $(PxL)_n$ = $(P/A)_n$ = p_n; that is, the energy required per cubic inch expressed as Lb in/in^3 equals numerically the force required to pull the rod through the die, expressed as Lb/in^2.

✦ ✦ ✦

IT has been found that the forces required to reduce various metals through dies are approximately proportional to the amount of draft given. When drawing a pure metal wire through a series of dies of equal draft, the forces required (Lb/in^2) generally increase with each successive draft, but at a diminishing rate.

✦ ✦ ✦

COPPER wires were reduced successively through a number of dies of 21% draft. The forces required in each draft were plotted against the resulting reductions and gave a curve 'A' Fig. No. 1. Another lot of the same material was similarly reduced by 37% drafts, by skipping every second die. Curve 'B' Fig. No. 1 represents the forces required. Other wires of the lot were given single drafts of 50%. The diagram shows that in all cases, the forces required in the initial draft are approximately proportional to the amounts of drafts. For all successive drafts curve 'B' shows forces higher than those of curve 'A' nearly in proportion to the amount of drafts.

✦ ✦ ✦

PIECES of wires which had been given a number of drafts of 21% were then drawn by 37% drafts; the forces used now move from curve 'A' to curve 'B'. Correspondingly, wires which had been given respectively 50% and 37% drafts were subsequently drawn by 21% drafts. On plotting the forces of these draws, in each case they move down from their respective initial curves to curve 'A'.

✦ ✦ ✦

IT is thus indicated that the forces depend on the amount of final draft and on the total reduction; but are otherwise virtually independent of the size of the drafts previously given.

Designated as Official Publication by the Wire Association

THESE facts suggest that the force required in a given draft, when divided by the amount of draft can be represented by a curve of the form: $z = p/d = z_o + F(S)$. where p is Lb/in^2, d = draft, $S = R - \triangle R$, the state of the metal at the beginning of the draw. R is the total reduction obtained, $\triangle R$ is the draft used, and z_o is the approximately constant ratio of the force required in the first draw to the reduction there given; F indicates the function implicit in curves 'A' and 'B'.

✦ ✦ ✦

ALL data on which this hypothesis was formed are given in Table I; the experiments from which they are obtained were carried out on a Baldwin-Southwark hydraulic tensile testing machine provided with an attachment for holding the dies. It is to be noted that no equipment designed to eliminate non-axial loading, such as ball and socket supports in die holder and grips had been incorporated in the design. The dies used for copper wires were standard dies of hard steel. The speed of the cross-head was 6 in. per minute. Neither grain size nor the temperature of the metal in the dies were controlled. The heat to be dissipated in the heavier drafts may increase the temperature of the metal above that in the lighter drafts. The forces were read on the dials of the testing machine. Variations in readings usually were around 5%, but occasionally higher. Ten readings usually were taken and averaged.

TABLE I

D, in	d%	Rt-%	State %	P, lb.	p lb./in.	$Z = \frac{p}{d}$	F (S)
.257	21	21	0	740	14,300	681	
.229	37	37	0	1170	28,000	758	
.182	36.9	60.4	37	1160	44,600	1208	390
.162	20.5	68.7	60.4	585	26,400	1385	524
.144	21.0	75.2	68.7	470	28,850	1375	494
.144	37.0	75.2	60.4	797	49,000	1305	432
.128	21	21	0	200	15,500	738	
.114	20.8	37.3	21	234	22,900	1100	218
.114	37.7	37.7	0	302	29,400	782	
.091	36.3	60.3	37	303	46,400	1285	351
.081	20.6	68.4	60.3	160	31,100	1510	525
.114	20.8	87.3	83.1	345	33,300	1600	644
.114	37.3	87.3	79.8	540	51,900	1390	467
.102	21.3	90.2	87.3	276	32,050	1503	550
.091	20.8	92.2	90.2	230	35,400	1700	762
.091	36.5	92.2	87.3	340	52,000	1425	468
.081	20.6	93.7	92.2	180	34,950	1695	680
.257	37.7	37.7	0	1500	28,900	766	
.229	20.8	50.6	37.7	1170	27,900	1345	583
.229	50.6	50.6	0	1835	43,700	865	
.204	37.0	37.0	0	870	26,650	720	
.162	37.0	60.3	37	890	43,150	1165	328
.128	37.5	75.2	60.3	800	46,600	1240	365
.102	36.4	84.5	75.2	400	49,000	1345	415
.081	37.0	90.7	84.5	285	55,350	1495	513
.204	50.2	50.2	0	1300	39,800	783	
.182	20.4	60.4	50.2	730	28,200	1375	535
.162	20.7	68.7	60.4	645	31,300	1510	638
.128	37.5	80.4	68.7	635	49,300	1315	423
.182	20.3	20.3	0	337	13,450	663	
.162	20.7	37.1	20.3	495	24,000	1160	324
.144	21.1	51	37.1	525	32,100	1515	615
.128	20.8	60.6	51.0	392	30,500	1465	552
.114	20.8	68.8	60.6	310	30,200	1453	519
.102	20.0	75.0	68.8	250	30,600	1530	574
.091	20.8	80.2	75.0	205	31,500	1515	534
.081	20.6	84.2	80.2	155	30,100	1465	486
.289	21.2	44.5	29.8	1520	33,200	1095	422
.257	20.8	55.0	44.5	1336	25,800	1240	522
.229	20.6	64.3	55.0	1150	27,900	1352	591
.204	20.6	71.8	64.3	940	28,800	1352	555
.182	20.4	78.2	71.8	760	29,200	1430	595
.162	21.6	83.0	78.2	630	30,700	1420	557
.144	21.0	86.5	83.0	500	30,700	1462	568
.129	19.8	89	86.5	410	31,300	1580	651
.114	21.8	91.4	89.0	340	33,200	1523	581
.102	20.0	93.2	91.4	260	31,450	1572	593
.229	20.8	20.8	0	655	15,650	752	
.204	20.8	37.0	20.8	765	22,400	1075	294
.182	20.4	19.8	37	730	28,500	1395	561
.144	37.6	37.6	0	530	32,500	865	
.128	20.8	17.6	37.6	330	25,600	1332	348
.128	50.6	50.6	0	630	48,900	966	
.114	20.5	50.6	50.6	265	25,700	1235	334

NOMINAL die sizes were used for calculation. All calculations were made on a 10″ slide rule or read off the logarithmic plot in Fig. 1.

✦ ✦ ✦

BEFORE proceeding to discuss fully the results obtained certain relations between wire diameters, drafts and reductions, and the coordinate system of Fig. No. 1 will be described.

✦ ✦ ✦

THE percent reduction of any draw, the draft, is 1) $d = [1 - (D_n/D_{n-1})^2]$ 100 and the total reduction of an originally soft wire is:

2) $R_n = 100\ [1 - (D_n/D_o)^2]$ where D_o is the diameter of the annealed wire, D_{n-1} and D_n are the diameters in any two successive draws. From 1) we have:

$D_n/D_{n-1} = \sqrt{1 - .01\ d}$.

Thus, when using substantially equal drafts for a series of draws $D_n/D_{n-1} = C$, constant.

In the present work, d was either 21% or 37% making C .89 and .79 respectively.

When using equal drafts and starting with a wire of diameter D_o the successive diameters are: $D_1 = D_o \cdot C$; $D_2 = D_o \cdot C^2$ and $D_n = D_o \times C^n$ 3).

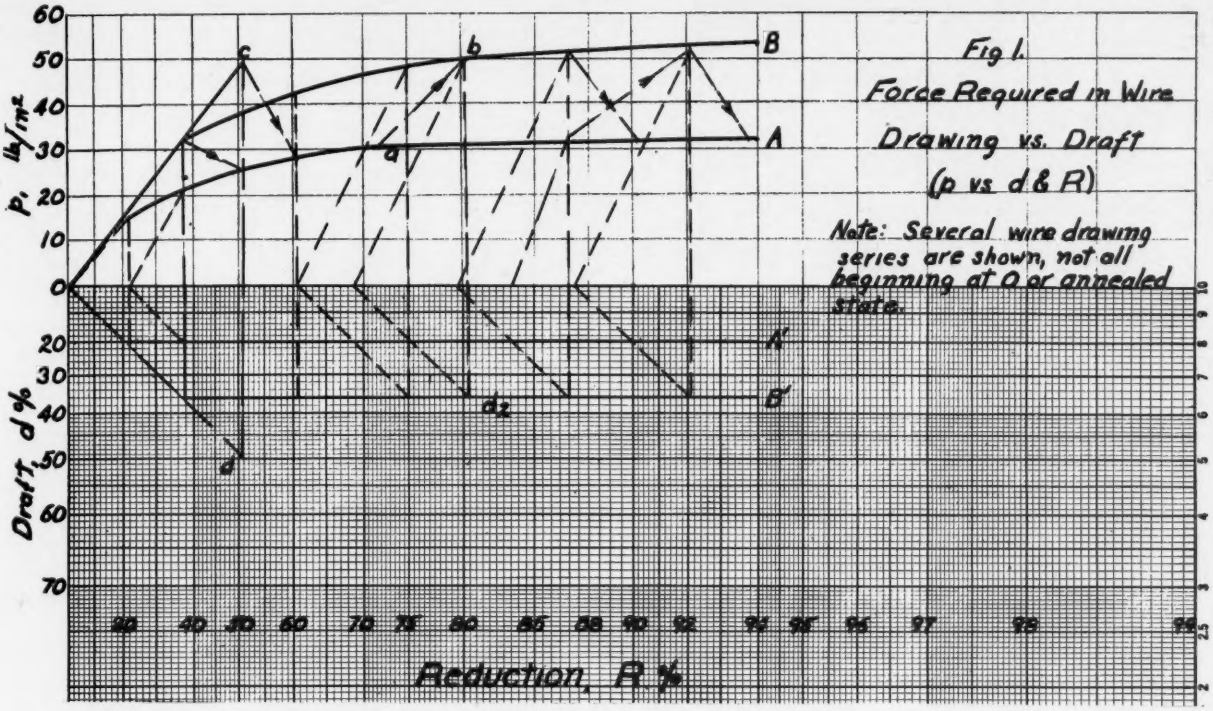
✦ ✦ ✦

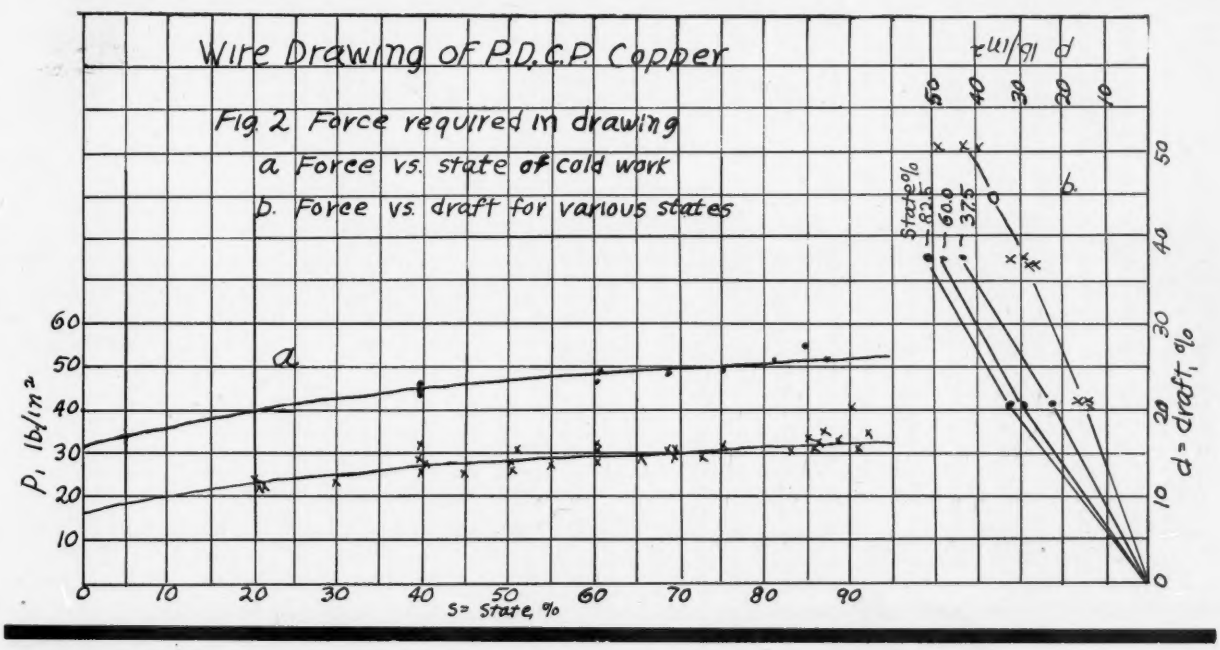
IN order to construct the coordinate system of Fig. No. 1 note that the increase in reduction $\triangle R = R_n - R_{n-1}$ or 4) $\triangle R = 100\ (D_{n-1}^2 - D_n^2) / D_o^2$ and 5) $\triangle R/d = [(D^2_{n-1} - D_n^2) / D_o^2] \times (D_{n-1}^2/D_{n-1}^2 - D_n^2) = (D_{n-1}/D_o)^2$. Now, $R_{n-1} = 100\ [1-(D_{n-1}/D_o)^2] = 100\ (1 - \triangle R/d)$, hence $d = \frac{R_n - R_{n-1}}{1 - R_{n-1}/100} = \frac{R-S}{1-S/100}$ 6) $\frac{d}{R-S} = \frac{100}{100-S} = \frac{100-d}{100-R} = \frac{d}{\triangle S}$ and $\frac{\triangle S}{100-S} = .01d$. This suggests a logarithmic relationship between

Σd and R, and for each specified draft a curve representing a number of increments in R could be drawn up.

✦ ✦ ✦

USE of logarithmic plotting paper, however, is more convenient, particularly when marking the divisions by R rather than the corresponding values of (100—R), and the drawing of 45° lines through origo and other points on the abscissae. The coordinate system of Fig. No. 1 is such an arrangement. From this plot the reductions resulting from any single draw may be read off directly by following the 45° line out from any given point on the abscissae until it intersects the horizontal parallel running out from the point on the ordinate which indicates the desired draft. From the point of intersection a perpendicular is followed back to the abscissae. The point arrived at immediately gives the resulting reduction. By repeating this simple process the reduction resulting from any number of drafts of any sizes may be obtained. In general, when given any two of the three variables d, S and R = S + △R, the third one may be found practically at a glance. For example, if we start with a state





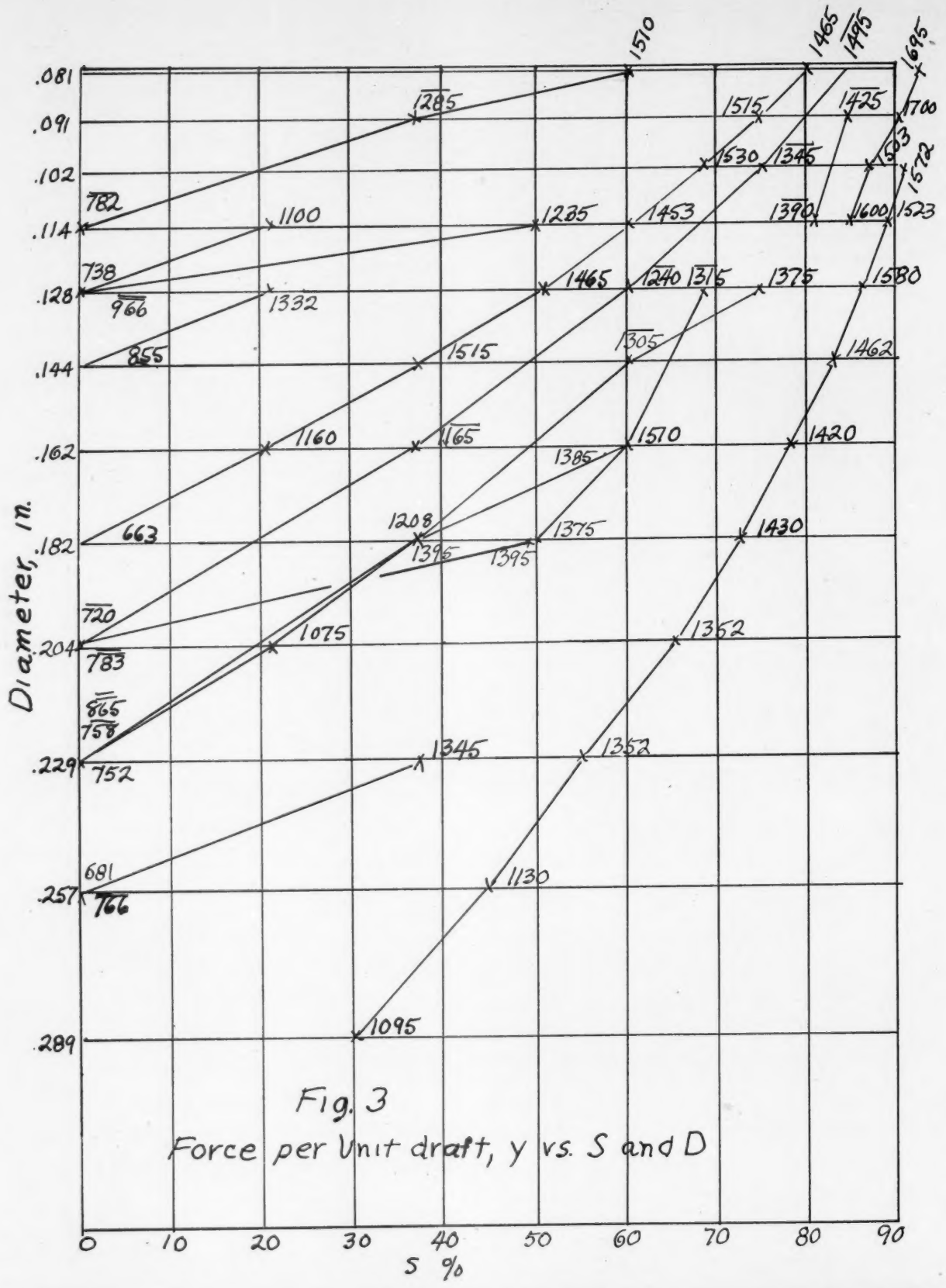


Fig. 3
Force per Unit draft, y vs. S and D

of reduction of S = 50% and want to find the draft required to end up with 60% reduction, we follow the 45 line out from S = 50 until it intersects the perpendicular from 60%. Following the horizontal parallel into the ordinate we read off 20% draft.

✦ ✦ ✦

RETURNING now to discussion of the forces shown in Fig. No. 1, it is seen that the tangents to the angles C, O, d for any draft give values of $Z_o = \frac{p}{d}$ while the tangents to the angles, a R_1 d_1; b R_2d_2 etc. give the unit drafts for various states of cold work. The unit drafts on the 21% and 37% sections are slightly different, with those of the 37% or B section the smaller. Until more is known about the possible effect of temperature increases in higher drafts, conclusions based on this observation will be postponed.

THE curves 'A' and 'B' are sections through the surface p = F (R,S); whose traces are A^1 and B^1 respectively. The individual experimental points on any of these curves are more or less close to the sections according to the exact diameter of the wires which, of course, change with the use and wear of the dies.

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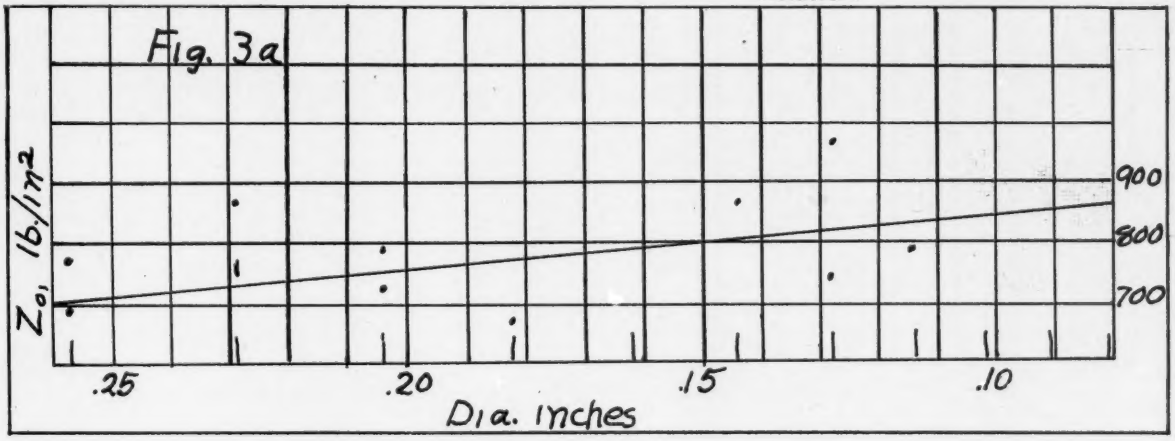
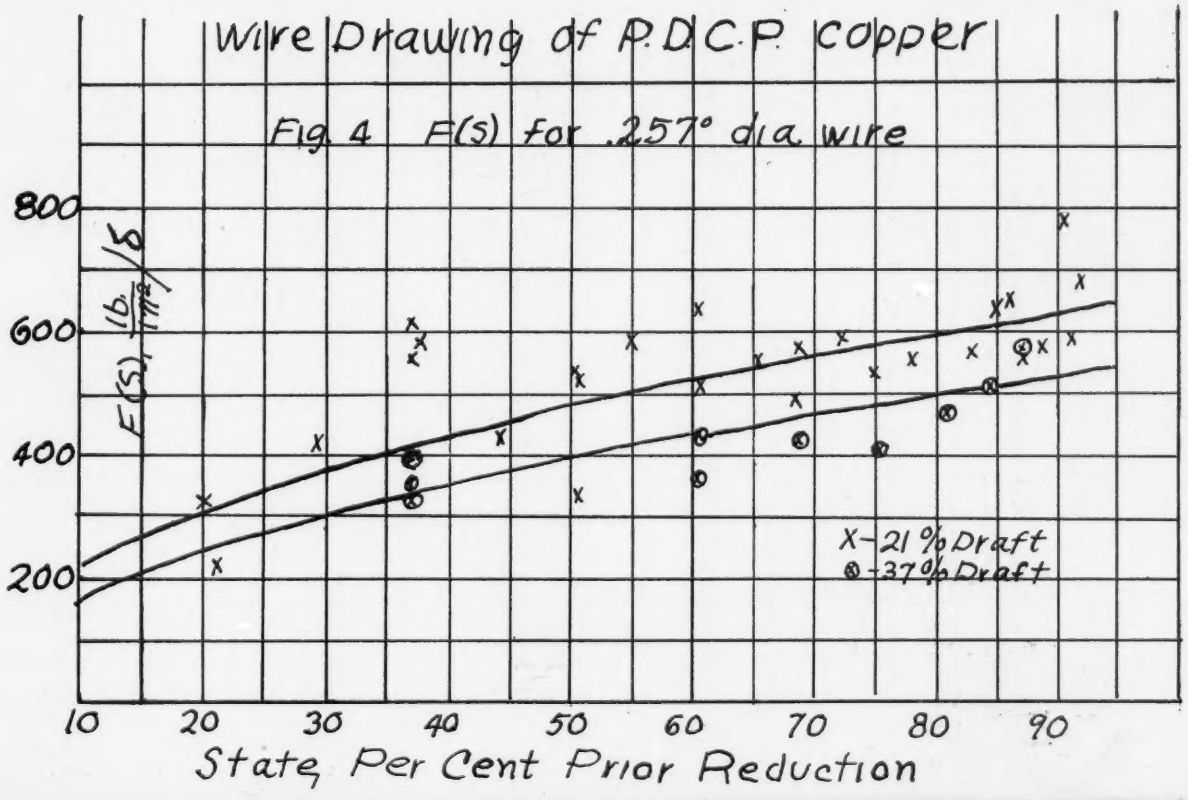
THE plot in Fig. No. 1 is very useful for a complete view of the progress and interrelation of





the factors which influence the forces in wire drawing. However, simplified projections may be used for routine testing. Plots of such projections are shown in Fig. 2. In Fig. 2a the forces are plotted against the state of cold work S, for 21% and for 37% drafts respectively. It is seen that for both curves $p = p_o + F_d (S)$.

TABLE II
Energy per unit draft for .257 inch diameter wire

	F (D)	in. lb. per in.^{3}	ft. lb./lb.	100 B/A
Aluminum	2.09 (.257-D)	325 + 14.5 √S	278 + 12.4 √S	4.46
Iron	1.58 (.257-D)	1350 + 100 √S	395 + 29.3 √S	7.42
Copper	1.2 (.257-D)	718 + 68 √S	187 + 17.6 √S	9.40
Zinc	$\left(\frac{.257}{D} - 1\right)$	435 + 12.6 √S	137 + 3.96 √S	2.89
Tin	247 (.257-D)	90 + 7.4 √S	28.4 + 2.34 √S	8.25
Lead	1	75 + 0 √S	15 + 0 √S	0
4.5% CuSi	1.24 (.257-D)	1850 + 268 √S	505 + 73 √S	

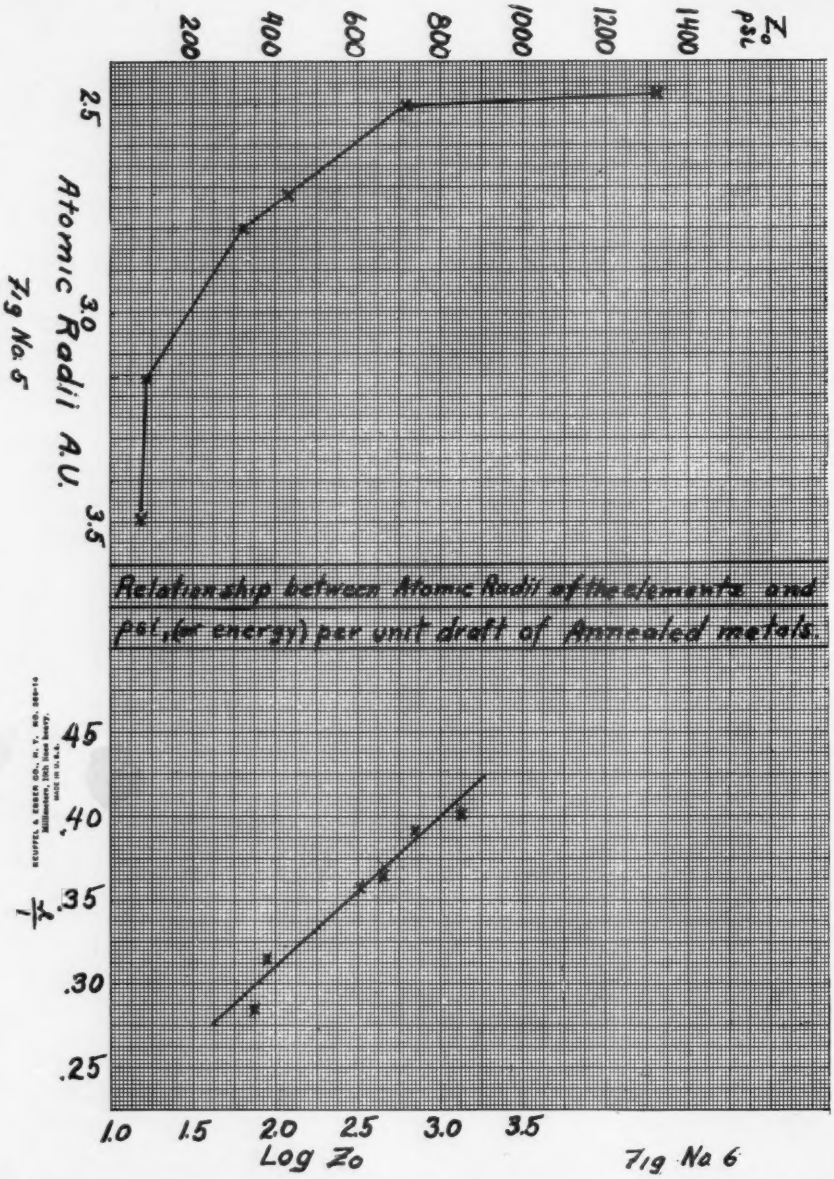


FIG. No. 2b shows p against the drafts d, $p = p_o + F_s (d)$ for various states, which amounts to sections through the plot 2a. The relation between p and d shown, apparently varies for various states S, but are approximately linear as before mentioned. It is therefore possible that $Z = p/d = Z_o + F(S)$ within the experimental error.

✦ ✦ ✦

IF we compare the values of Z in Table 1 for equal reductions but drawing to different diameters, it appears that the forces required increase as the diameters decrease. It is therefore necessary to state that $Z = p/d = F (Z_o, S, D)$. Values of Z thus can be projected on a coordinate system whose two other axis are S and D, such as is shown in Fig. No. 3. There the coordinate of S increases simultaneously with decrease of D while Z increases.

✦ ✦ ✦

WHEN new values of Z_o (=p/d for the annealed state) are laid out for various diameters, they fall on a curve whose ordinates increase when D decreases as shown in Fig. 3a. Within the limits of .081" dia. and .257" dia., the curve may be approximated by a straight line 7) $Z_o = 718 - 862 (.257—D)$, as lb/in^2. Variations in Z with D is probably largely due to external or die friction. If the die friction can be estimated the net force and energy of drawing can be obtained. Under fixed conditions of die width, aperture angle, speed of drawing, lubrication, grain size, and temperature of working metal, the work of friction per cubic inch is a function of the cylinder area of the drawn rod, $E = F (LxD) = F (D/A) = F (1/D)$.

✦ ✦ ✦

IF we assume that the net energy of deformation under standard conditions is a property of the metal, then experimental values of this property obtained by drawing through dies of varying aperture diameters, are quantities which decrease with increasing diameters, $Ex = E + F (\frac{1}{D})$. Extrapolation to $D = \infty$ then allows evaluation of the effect of

diameter, including external or die friction. Experiments under such controlled conditions have not yet been made, and all calculations in the following have been referred to an arbitrary standard diameter of .257 in. (according to equation 7).

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INSPECTION of Fig. No. 3 shows that there is generally a smaller increase in Z with decreasing D, and a larger increase in Z with increasing S. On sections of constant S the increase in Z with decreasing D is approximately of the same magnitude. However, if we look at the increments for the higher values of S, they appear to be larger than those for the lower values of S. It is also probable that this increase is due partly to the die friction, and this will increase with p and therefore with S and Z. Provisionally it may therefore be formulated that $\frac{d(Z)}{d(D)} = F(Z)$, or for the sake of simplicity, $(Z-Z_o)/Z_o = f(S)$ independent of D, and $Z = Z_o + (\frac{Z-Z_o}{Z_o})$ $Z_o = Z_o (1 + \frac{Z-Z_o}{Z_o}) = Z_o (1 + f(S)) = Z_o + F(S)$ where values of Z_o are given in equation 7).

✦ ✦ ✦

THE present data does not allow Z_o to be extrapolated to infinity diameter; but f (S) may be estimated, and an arbitrary standard diameter may be chosen from the sizes experimented with. Choosing the diameter of the largest die used .257" we get $Z_{.257} = (Z_o)_{.257} \times (1 + f(S))$ or $Z_{.257} = (Z_o)_{.257} + F(S)_{.257}$.

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VALUES of f(S) or F(S) may be determined from the data and plotted as in Fig. 4. The data for 21% draft and the 37% draft appear to fall on separate curves. The values for the 37% draft are the smaller ones and this may be due to the larger heating effect occurring with the heavier draft. With 37% draft $F(S)_{.257} = 56\sqrt{S}$ and with 21% draft $F(S)_{.257} = 68\sqrt{S}$ or taking the draft d into the equation, $F(S)_{.257} = 718 + 82(1 - \frac{d}{100})^{.82}\sqrt{S}$

9a) $(Z)_{21} = 718\ [1 + 1.2(.257 - D)] \times (1 + .0945\sqrt{S})$. and

9b) $(Z)_{37} = 718\ [1 + 1.2(.257 - D)] \times (1 + .078\sqrt{S})$.

Here Z is in units of lb/in² and lb.in/in³.

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THE energies may also be stated as energy per lb. of copper, by multiplication of the term $(Z_o)_{.257} = 718$, by conversion factors; $Z_o w = .259 \times 718$ lb. ft/lb. = 186 lb. ft/lb. While the rest of the terms of equations 9 are unaffected by the conversion factors.

✦ ✦ ✦

THE values of Z and p given in the preceding paragraphs evidently are some approximate measures of the workability of copper under stated conditions. It seems that determinations of Z and F(S) at for instance .257" dia. for a number of metals and alloys will give a reliable means of comparing fundamental workability factors.

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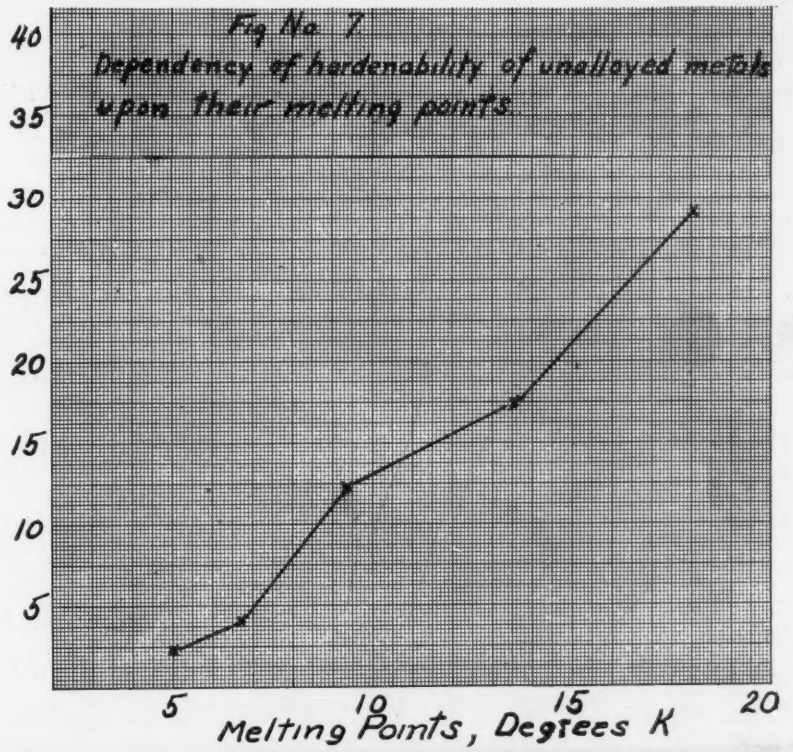
SINCE the Lb/in² in any draft give the energy required to deform 1 cubic inch of metal, Z gives the energy required to deform 1 cube inch for unit reduction of 1% draft, in any draw. The total energy of deformation then is the sum of the energies of each draft, or $\Sigma E = E_1 + E_2 + E_n$. Obviously, ΣE is smaller the fewer the drafts used to accomplish the reduction. The maximum draft possible is, of course, limited by the yield points. Thus, p =

(*Please turn to Page 178*)

TABLE III

	Z_o in lb./in³	log Z_o	r	$\frac{I}{r}$	m. p. °K	B ft. lb./lb.
Pb	75	1.875	3.49	.286	600	0
Sn	90	1.954	3.16	.316	505	2.34
Al	325	2.512	2.80	.357	932	12.4
Zn	435	2.639	2.74	.365	672	3.96
Cn	718	2.856	2.55	.392	1356	17.6
Fe	1350	3.130	2.48	.403	1803	29.3



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Minimizing Rejects

By Thomas W. Fazakerley

West Wickham, Kent, England

Some methods used by a British concern in reducing defective work in manufacture and eliminating rejects.

THE consideration of rejected or faulty work necessitates attention being paid both to the raw material involved as well as the labour cost and the proportionate overheads for the finished product. It will be found in the States as it has been in Great Britain that the progress of the war will be accompanied by a restriction in the amount of raw material made available to industry except for vital purposes and this tightening makes it imperative that firstly, reject work must be reduced to the lowest possible level and secondly that such wastage as is unavoidable is subjected to proper and adequate control.

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THE initial step towards such a control is the introduction of a Wastage and Scrap report to be of weekly compilation, department by department. This report, when analysed, will present a statistical review of gross actual wastage which must be compared with the standard estimated allowance in that direction. The difference between actual and estimated scrapped values will demonstrate either a high or low grade of manufacturing efficiency or an ability, correctly or incorrectly to assess the reasonable standard wastage allowance.

✦ ✦ ✦

TO permit faulty, scrapped or rejected goods, whether in part or in whole, to be inactive for an uncontrolled period is an invitation to disaster. Both the demands of space limitation and the present inability to obtain pre-war standards and quantities of materials demand that any accumulation of wastage is dealt with drastically and with expedition.

Defective Work in Manufacture

EVERY estimate for cost, whether qualitative or quantitative, incorporates an allowance for faulty articles which must accrue before contractual completion is attained.

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THIS provision must naturally vary with the class of work, the quality of the material and the standard of labour employed but, generally speaking 10% is regarded as a fair and reasonable average. Consequently the acceptance of an order for 100 articles calls for the cost estimation of 110 articles in order to make approximate provision for the 10% rejections which will come about during the various stages of production.

✦ ✦ ✦

Returns From Purchasers

RETURNS from customers with the accompanying claim that the goods delivered were substandard usually fall within the province of the Sales Department although the Production section may, in certain cases, assume responsibility. To whichever falls the task of investigation, it may be assumed that the 'faulty' returns have been subjected by the buyer to rather more than normal usage. Unless the examples are of a particularly glaring nature it is wiser to accept such returns and to attend to their replacement or reconditioning rather than run the risk of alienating the goodwill of a customer. However high may be the efficiency ratio of the producing, inspection and delivery departments it is almost certain, that from time to time, goods which were in fact faulty to a major or minor extent will be despatched. For this reason, consideration to the possibility and probability of such returns should not be overlooked.

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Obsolete Goods

USUALLY, obsolete goods will be transferred to and handled by the Sales Department. In theory if not in practice, the ordering of goods by the Sales section and the subsequent delegation of those goods to the warehouse involves the Sales department in an obligation to dispose of them at the pre-determined price. Inability or failure to do so would mean that the Sales department is debited with the entire cost of such losses.

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THE sales section may frequently be involved in such losses by a 'volte face' on the part of the management in so far as policy is concerned, a reduction in the price range of a competing organization or a general change in public demand for an article of similar calibre but perhaps of differing size and shape. Excess materials which are slow of movement and which gradually tend towards obsolescence should remain a production liability.

✦ ✦ ✦

Centralization of Defective Work

FROM the book-keeping and accountancy points of view it is a comparatively simple matter to debit the factory section with the

(*Please turn to Page 190*)

Concentricity

By E. F. Hansen,

Thomson Laboratory, General Electric Company

Schenectady, New York

Testing concentricity of enamel film on round wire is now made rapid by the development of a special tester utilizing electronic circuits.

THE insulating film on round enameled magnet wire at any cross section should be concentric about the conducting core. At the times when wire-coating machinery is undergoing adjustment, tests must be made to check the concentricity of the coating of film. Since various other laboratory tests are made to determine abrasion resistance and dielectric strength of the enamel insulation, the results of these tests are naturally affected by the thickness and concentricity of the insulation.

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PROBABLY the most reliable method of determining film thickness and concentricity is to examine the wire cross section with a microscope. In order to do this, it has been customary to mount a sample of the wire in Woods metal and then carefully polish the cross section. The film thickness may then be measured by means of a measuring microscope or photomicrograph. These methods consume much time, however, and are not convenient when a large number of samples are to be checked.

THE tester described in this article was developed to fill the need for a quicker and more convenient method of checking enameled-wire concentricity. Its principal application has been in the laboratory and it has become a useful addition to the existing wire-testing devices which are designed to maintain quality in wire production.

✦ ✦ ✦

Operation

FRONT and top views of the tester are shown in Figs. 1 and 2. With the cover lifted, a seven-inch sample of wire is inserted in a turning chuck and placed in position on brass plates between the guides provided. A hinged insulating block, shown in place in Figs. 2 and 3, applies pressure to hold the wire flat on the brass plates. The wire sample is rotated by the large knob to get minimum deflection of the indicating instrument. The sensitivity of the tester is then varied with the small knob until a reading of 1.0 on the indicator scale is obtained. The wire is then rotated to get maximum deflection. The latter reading is a measure of concentricity in units of ratio of maximum to minimum film thickness.

✦ ✦ ✦

THE tester is self-contained in a metal-shielded cabinet and operates directly from 115-volt 60-cycle mains. A gaseous regulator tube assures readings which are independent of fluctuations in line voltage. Circular enameled wire of 0.025 to 0.065 in. diameter with a film thickness of about 0.001 to 0.006 in. can be tested. The time required for testing a sample is about one minute.

✦ ✦ ✦

Principle of Operation

THE tester operates on the fundamental electrical principle of proportionate increase in capacitance of two conductors as the thickness of the dielectric between them decreases. A brass plate is one of these conductors,

Reprinted from the November, 1942 issue, of the "General Electric Review".

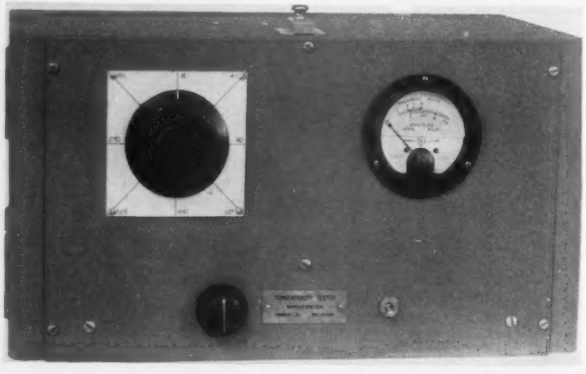


Fig. 1. Front view of the device for testing the concentricity of enamel film on wire.

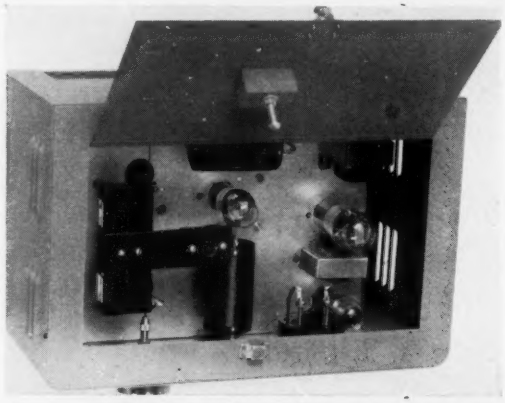


Fig. 2. Top view of the tester with cover open to show interior.

the film of enamel is the principal dielectric, and the copper core of the wire is the second conductor. The tester uses a series connection of two brass plates in the same plane per sample of wire and thus eliminates the necessity for scraping off insulation.

✦ ✦ ✦

AN example of nonconcentric wire is shown by the photomicrograph in Fig. 4 which is magnified fifty times. The capacities of selected wire samples with varying degrees of concentricity were found to be in the region of 5 to 7 micro-microfarads. The corresponding insulating film varied from 0.004 to 0.001 in. thick.

✦ ✦ ✦

IN order to get the required sensitivity, a high-frequency (900-kc) current is used in the indicating circuit. A tuned-grid tuned-plate oscillator is employed to generate the high-frequency current. The circuit is shown in Fig. 5. The capacitance of the wire sample C_1 shunts the grid-plate interelectrode capacitance of the type 37 triode oscillator tube V_1. If the wire is not concentric, its rotation will change the capacitance and thus vary the coupling between the grid and plate circuits of the oscillator. An increase in the film thickness was found to cause a proportionate decrease in capacitance. A decrease in capacitance, and consequently in coupling between grid and plate circuits, results in an inversely proportionate increase in the d-c plate current drawn by the oscillator tube, a characteristic of vacuum-tube oscillators. An increase in film thickness, therefore, is indicated by an increase in the deflection of the milliammeter M_1 which reads d-c plate current.

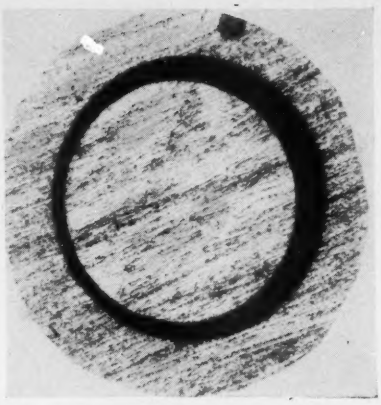


Fig. 4. Photomicrograph of nonconcentric enamel film (cross section magnified 50 X). ✦

✦ ✦ ✦

THE deflection was found by test to be a linear function of the film thickness over the used portion of the scale. This proportionality was verified and the milliammeter scale temporarily calibrated in mils thickness by means of measurements on photomicrographs of cross sections of many wire samples. To get a linear calibration, it was found necessary to tune the grid circuit to the third-harmonic frequency of the plate circuit. The sensitivity control regulates the per cent change of deflection per unit change of insulation thickness. It makes possible the present calibration in units of ratio, and consists of a very small variable capacitor C_2 shunted across the wire capacitance.

✦ ✦ ✦

THE calibration in units of ratio of maximum to minimum film thickness remains accurate even though some of the circuit parameters and frequency of oscillation change slightly. If the calibration were directly in mils thickness of insulation, adjustment and recalibration would be necessary when certain circuit components changed a small amount in value due to temperature, aging, or other effects. The average error in measurement of ratio was found to be about 5 per cent for all sizes of wire measured. A maximum error of 13.5 per cent was observed. The larger errors are caused, it is believed, by slight twists in the wire samples, and in some cases by change in concentricity along the length of the sample.

✦ ✦ ✦

THIS device rapidly and reliably furnishes test measurements used in making wire-coating machinery produce concentric film. The tester has also been helpful in the laboratory when used in conjunction with other types of wire-testing apparatus.

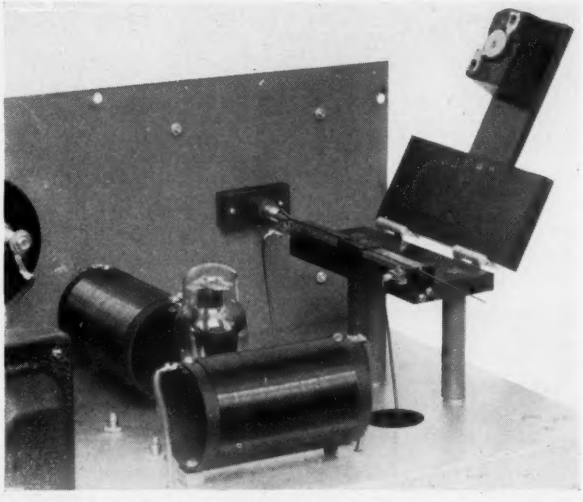


Fig. 3. View showing the wire sample in position on the brass plates, and the hinged means of holding it flat when the cabinet is closed. ✦

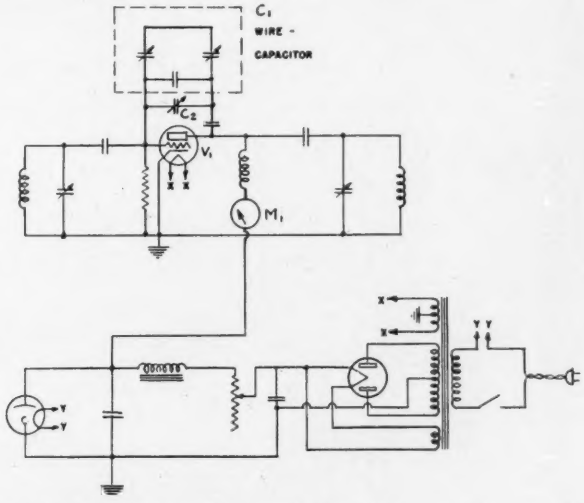


Fig. 5. Circuit diagram of the concentricity tester. ✦ ✦

Guide for Manufacture of Electric Cable

A chart giving direct readings on tape angles and pitch for various wrapping diameters and tape widths. ✦ ✦ ✦ ✦

THE chart shown herewith is an instance of the splendid co-operation volunteered by members of the Wire Association toward simplifying the many technical difficulties arising from the new demands on the wire industry created by the war effort.

✦ ✦ ✦

THIS chart was developed by **Charles F. VanHook,** Vice President of the Watson Machine Company of Paterson, N. J., and is one of his personal contributions to the production men of the industry.

✦ ✦ ✦

THE chart gives a direct reading at any single point of tape angle and of the lay or pitch for the wrapping diameter and the effective tape width employed, and is easily interpreted by an engineer or other person familiar with this type of graph.

✦ ✦ ✦

WITHOUT this chart of effective tape widths and wrapping diameters, but with the bases the same, one would have to obtain the angle of lay from the trigonometric value and then, by transferring to another trigonometric value and a multiplication, obtain the lay.

✦ ✦ ✦

INASMUCH as anyone in this sort of work begins with a wrapping diameter and an approximate idea of the angle of tape lay desired in most cases he can then read directly from the chart the lay or pitch and also the effective tape width, from which last he can readily determine his actual tape width, based on whether it is butted or lapped or an open taping job.

✦ ✦ ✦

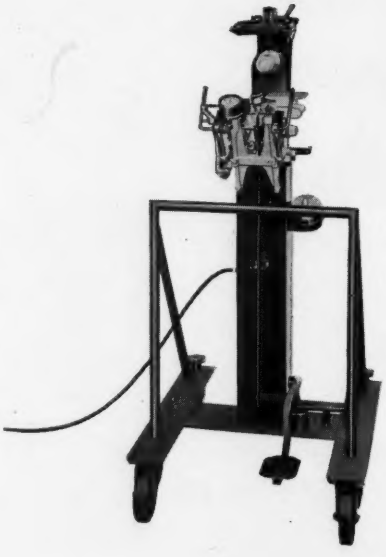
ON behalf of the Wire Industry, WIRE AND WIRE PRODUCTS takes this opportunity to express its appreciation to Mr. VanHook for the time and effort he has put into the preparation of this chart and for his generosity in making it available to others. This is a fine example of the American spirit of sharing ideas in the interest of winning the War.

MICROMETER PRECISION MICRO-WELD TRADE MARK REG. U. S. PAT. OFF.

CONTINUOUS IMPROVEMENT

MICRO-WELDERS with dial indicating annealing attachments are now available for high carbon wire.

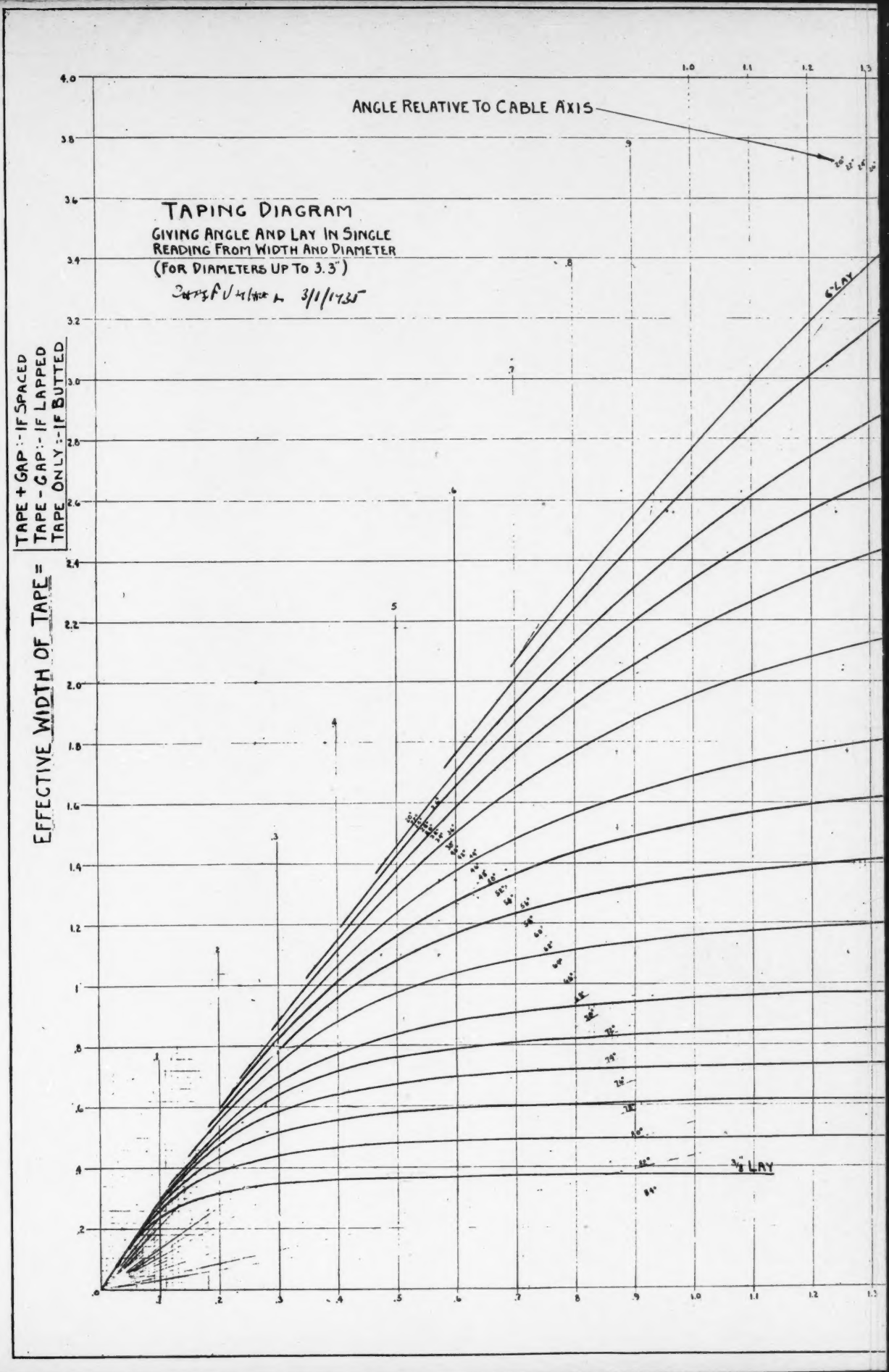
There is positive control of annealing temperature and already hundreds of these special MICRO-WELDERS are proving their dependability and satisfactory performance with leading manufacturers.



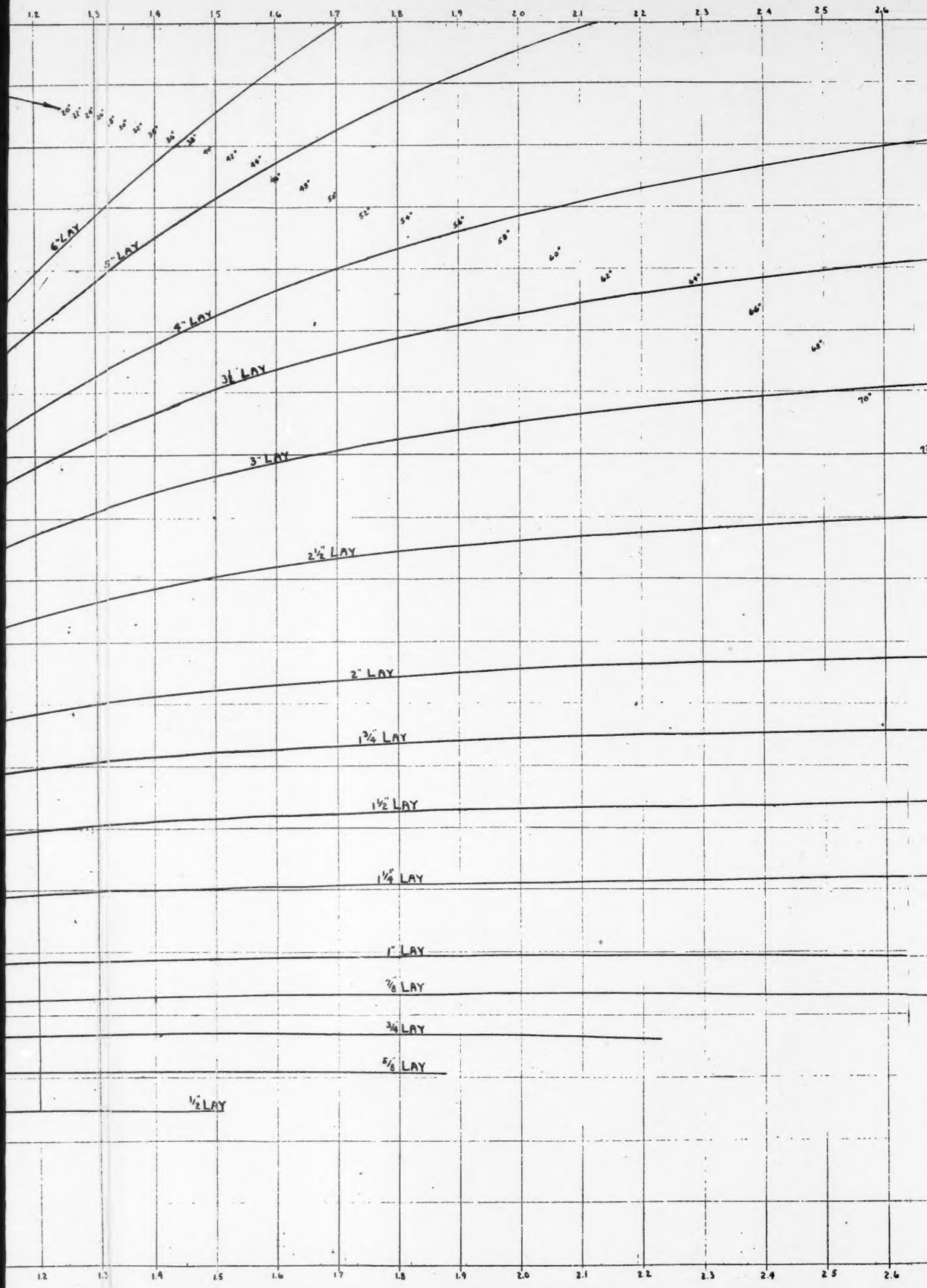
MICRO PRODUCTS COMPANY

20 NORTH WACKER DRIVE, CHICAGO, ILL.

Telephone, State 7468


TAPING DIAGRAM
GIVING ANGLE AND LAY IN SINGLE READING FROM WIDTH AND DIAMETER
(FOR DIAMETERS UP TO 3.3")
3/1/1935
ANGLE RELATIVE TO CABLE AXIS
6" LAY
3/8" LAY
EFFECTIVE WIDTH OF TAPE =
TAPE + GAP :- IF SPACED
TAPE - GAP :- IF LAPPED
TAPE ONLY :- IF BUTTED

WRAPPING DIAMETERS OF CABLE



WRAPPING DIAMETERS OF CABLE

TAPING DIAGRAM

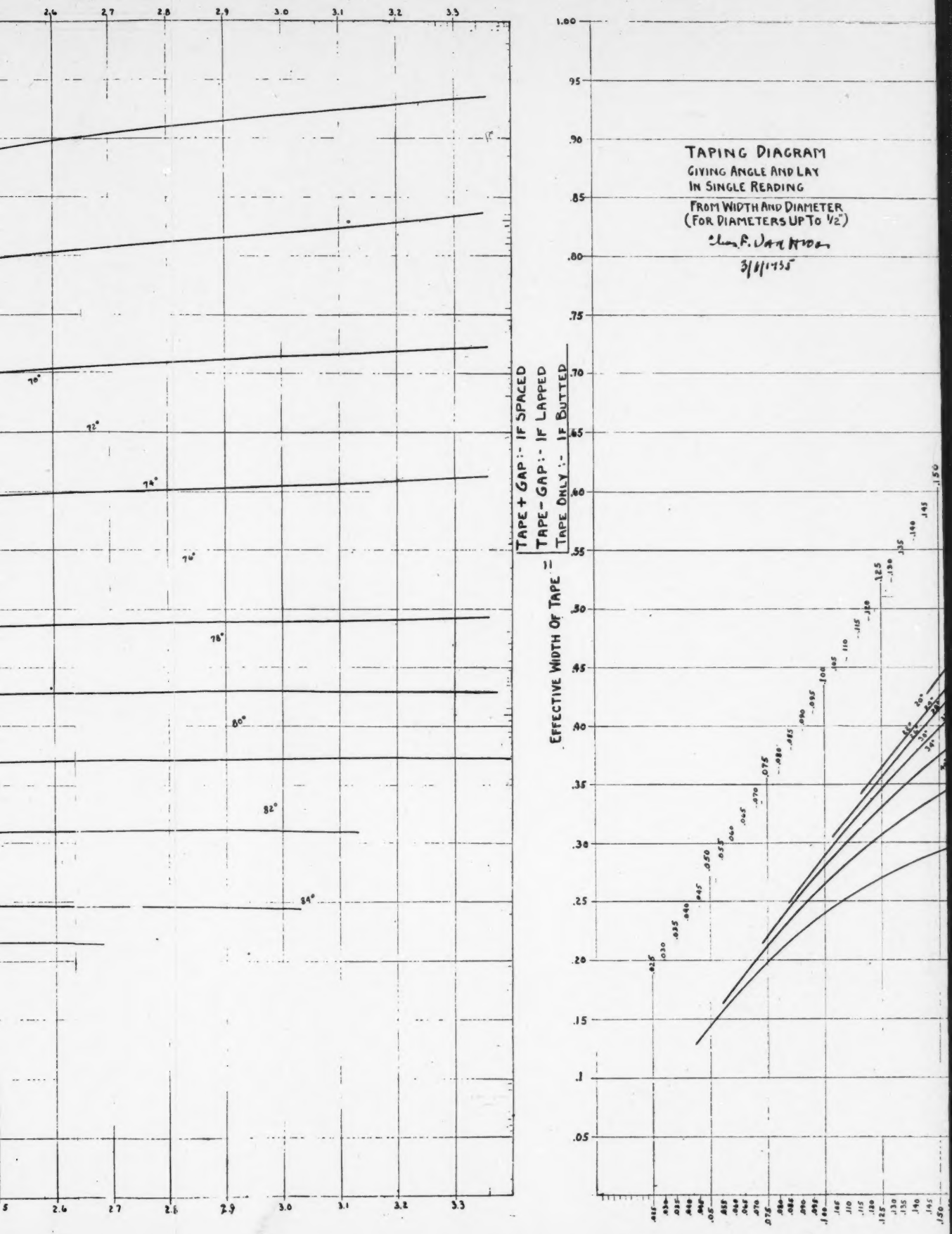
GIVING ANGLE AND LAY
IN SINGLE READING

FROM WIDTH AND DIAMETER
(FOR DIAMETERS UP TO 1/2")

Chas. F. Dawson

3/6/1935

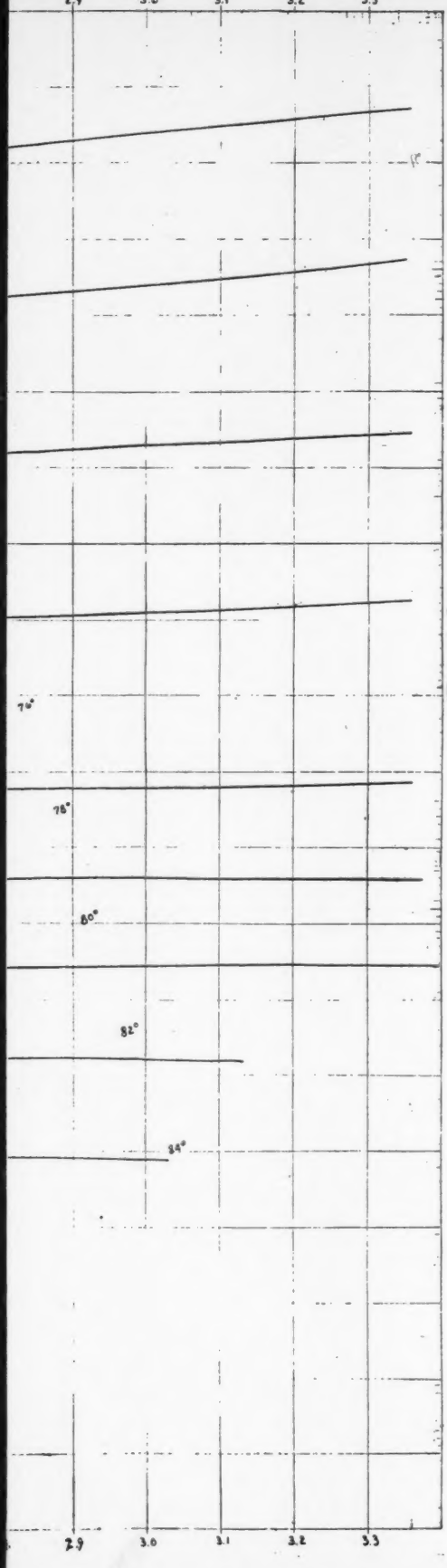
EFFECTIVE WIDTH OF TAPE = | TAPE + GAP :- IF SPACED | TAPE - GAP :- IF LAPPED | TAPE ONLY :- IF BUTTED |



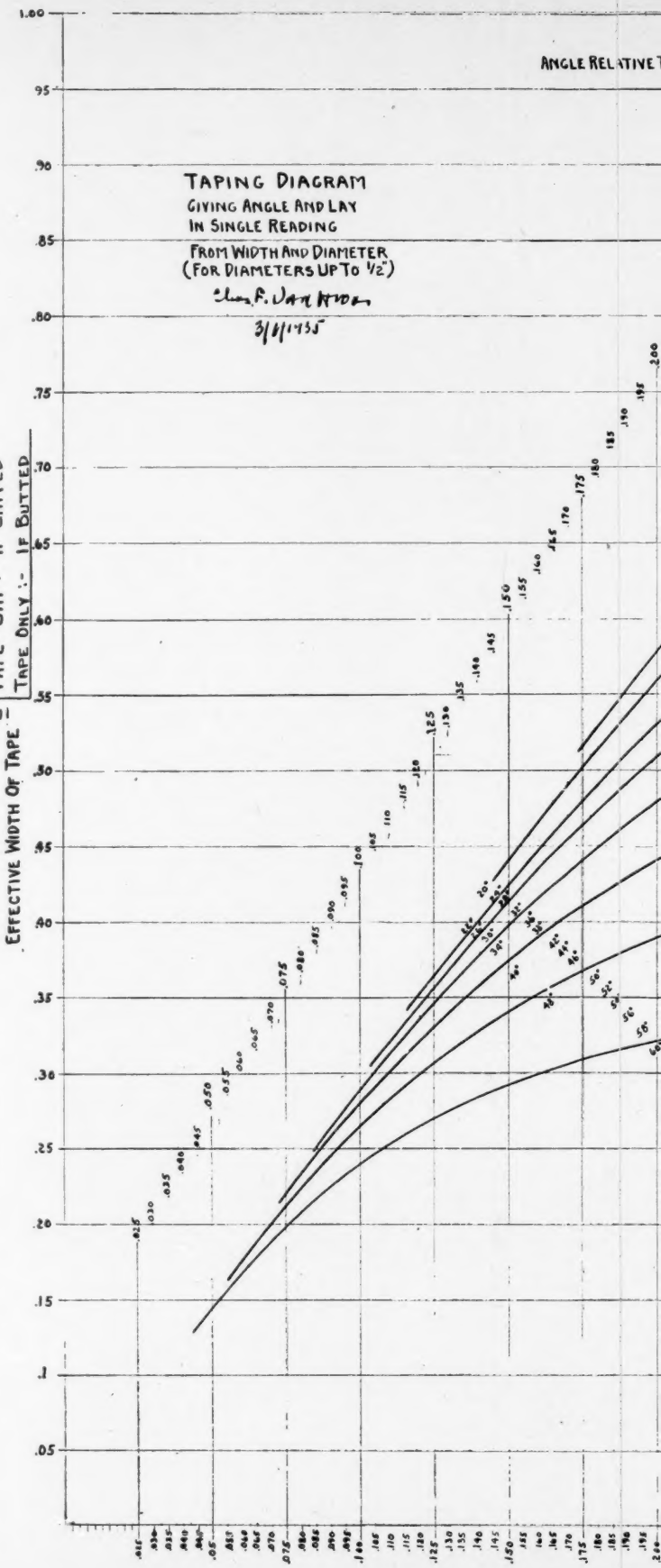
TAPING DIAGRAM

GIVING ANGLE AND LAY
IN SINGLE READING
FROM WIDTH AND DIAMETER
(FOR DIAMETERS UP TO 1/2")

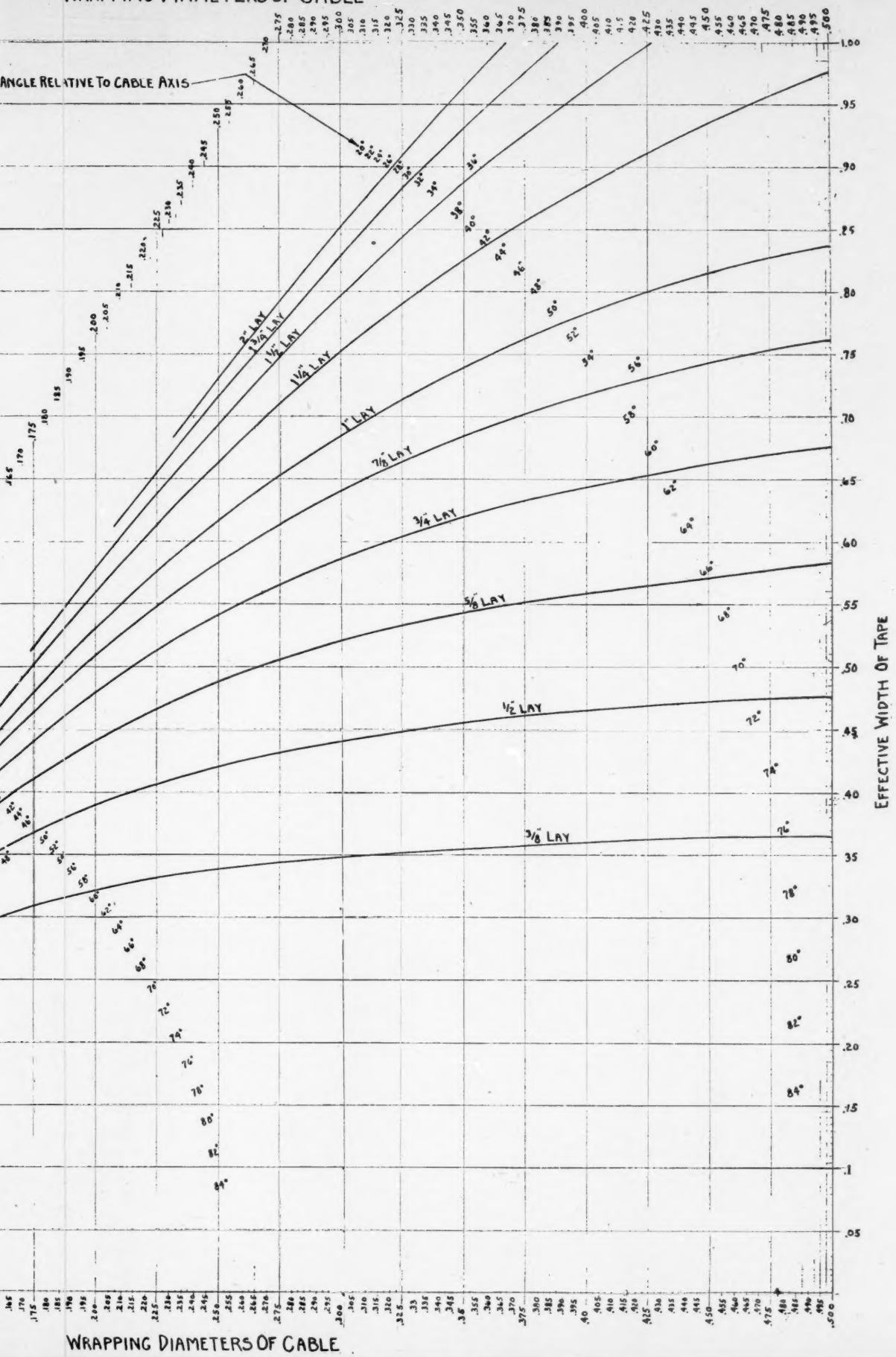
Chas. F. Van Horn
3/8/1935



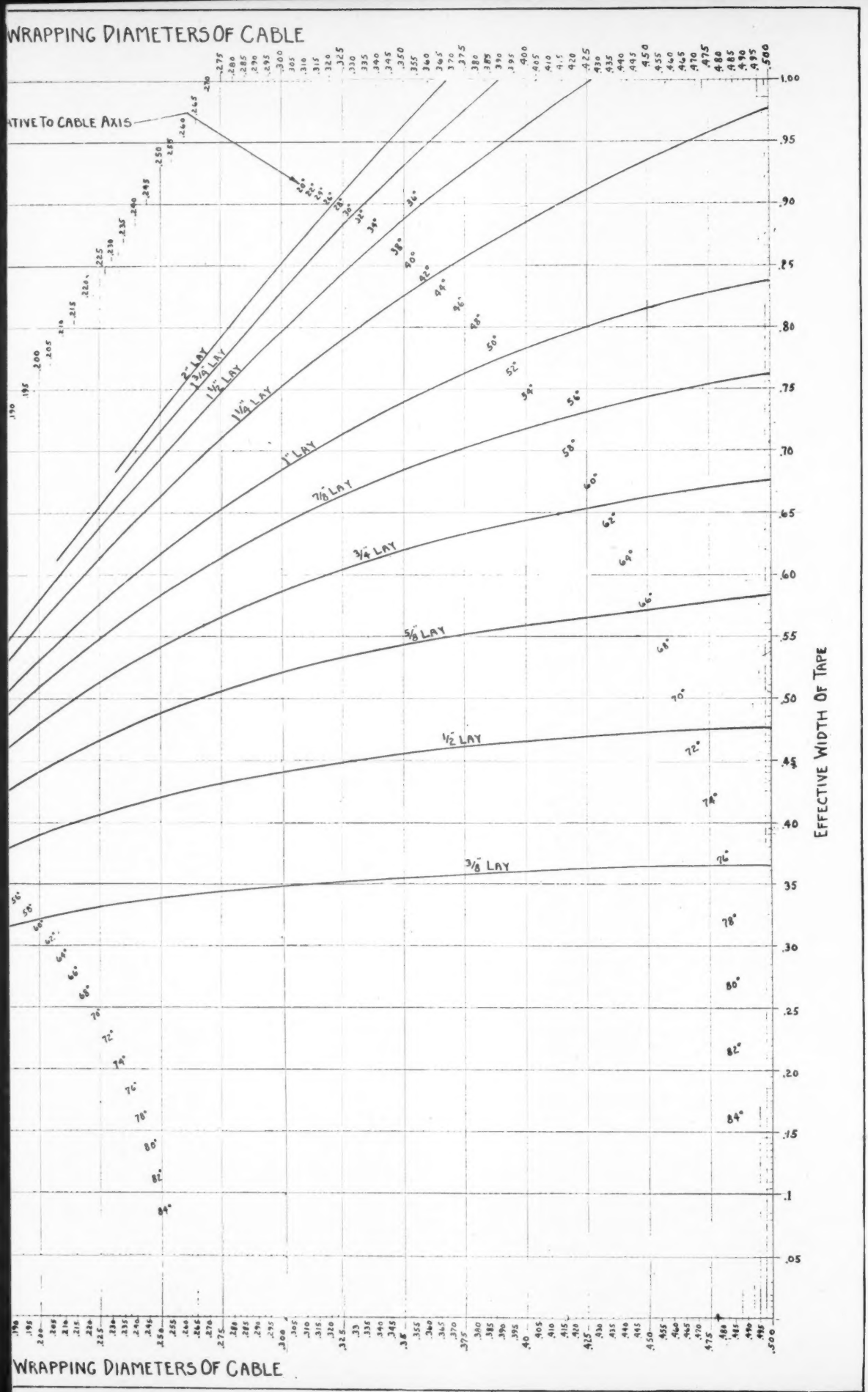
EFFECTIVE WIDTH OF TAPE = TAPE + GAP :- IF SPACED / TAPE - GAP :- IF LAPPED / TAPE ONLY :- IF BUTTED



WRAPPING DIAMETERS OF CABLE



WRAPPING DIAMETERS OF CABLE


WRAPPING DIAMETERS OF CABLE
ATIVE TO CABLE AXIS
2" LAY
1 3/4 LAY
1 1/2" LAY
1 1/4" LAY
1" LAY
7/8 LAY
3/4 LAY
5/8 LAY
1/2" LAY
3/8" LAY
EFFECTIVE WIDTH OF TAPE
WRAPPING DIAMETERS OF CABLE

Government Wire Production Information

Tin

U. S. Tin consumption will be cut another 12,000 to 15,000 tons in 1943 by a new General Preference Order M-43, issued to replace the previous orders M-43 and M-43-a. This new cut will bring anticipated tin use in 1943 to about one-half 1941 consumption.

✦ ✦ ✦

THE principal additional tin savings will be gained by reducing the tin content of solder from the 30 per cent formerly permitted to 20 per cent. Further savings will come from elimination of exceptions to quota restrictions previously granted to certain rated orders.

✦ ✦ ✦

THE third source of tin saving results from the way the new order is written, listing certain specific uses, the quantities, and the circumstances of use which are permitted, and forbidding all others. This type of order prevents leaks of tin to unforeseen uses. Additional savings will result from permitting the use of pig tin only where the use of secondary tin is not possible. All references to ratings are removed because tin is completely allocated.

✦ ✦ ✦

IN addition to continuing the complete allocation and use control, WPB may now specify the purpose and products for which any person may process tin. Also, no person may accept delivery of any tin if he has more than a practicable minimum working inventory, such inventory in no case to exceed forty-five days supply. The new order removes all distinction, between pig tin and scrap tin, it having been proved that one is as satisfactory as another.

✦ ✦ ✦

Steel Rail Re-rolling Mills

ACTION to preserve the skilled manpower and facilities of steel rail re-rolling mills for the

(*Please turn to Page 174*)

Moving Up with the Advance Units

KEYSTONE Wire

The success of practically every action — however small — depends heavily on a key Signal Corps man. And the success of his equipment depends on numerous wire mill products — such as Keystone is helping to produce.

The Signal Corps operator contacts many supporting forces — air, land and sea. They all use wire mill products too, in thousands of "fighting" forms.

Keeping up a continual flow of these war-time essentials has "drafted" much of our production until Victory is assured. As soon as that goal is in sight, some production may be released to meet, at least partially, a tremendous CIVILIAN demand.

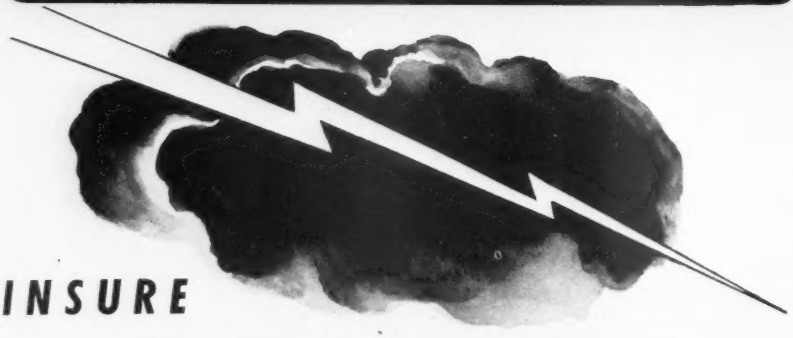
KEYSTONE STEEL & WIRE CO.
PEORIA, ILLINOIS

Special Analysis Wire for All Industrial Uses

SAMSON SPRING WIRE
A KEYSTONE STEEL & WIRE CO. PEORIA, ILL.

Just a few of thousands of wire mill products for war uses.

STANDARD
DRAWING LUBRICANTS



INSURE GREASED LIGHTNING SPEED!

Speed and increased production is essential to supply the fighting front. Equally important is the quality of the product manufactured to serve the needs of our fighting men.

Standard's wire drawing compounds are manufactured to facilitate greater speed in wire drawing and maintain the physical characteristic of all grades of steel, copper, or brass. Standard compounds will produce the finish you require, lime bright, extra bright, sull coated or special finishes for welding, lacquering, enameling, or plating.

Listed below are a few of our Standard Lubricants; others are listed in previous issues.

#94

For drawing zinc-coated wire dry. Also used for dry ripper hole on wet wire drawing of zinc-coated wire. Order extra fine grind. This compound puts a metallic coating on the wire.

#1

For low carbon wire, on either machines or benches. Also the drawing of processed wire, and producing common finishes. For the drawing of rods use medium grind, and for processed wire, use fine grind.

#48

A lower melting point soap for the drawing of high carbon rod or wire. Use this material in extra fine grind.

#40

For drawing low or intermediate carbon wire. For low carbon wire use medium grind, and for intermediate carbons use fine grind.

STANDARD INDUSTRIAL COMPOUNDS COMPANY

4600 FERDINAND STREET SIC CHICAGO • ILLINOIS

Government Wire Production Information

(*Continued from Page 173*)

war effort by concentrating a large part of the now limited production of concrete re-inforcing bars in these mills was announced recently by the Director of the Steel Division War Production Board.

✦ ✦ ✦

RAIL re-rolling mills produce steel bars, processed from old railroad rails, which are adaptable for many purposes, including the re-inforcement of concrete.

✦ ✦ ✦

AS a result of the various limitation orders on the use of steel, and because the construction program is nearing completion, the operations of rail re-rolling mills have been seriously curtailed. In some cases, temporary shutdowns have resulted, and in other cases, shutdowns are imminent. The action taken by the Steel Division, through Production Directives and Special Directives, prohibits steel mills (except those located in California, Washington, and Oregon) from producing concrete re-inforcing bars, except sizes which rail re-rolling mills do not regularly produce, or bars whose specifications cannot be met by rail steel quality.

✦ ✦ ✦

PRODUCTION of concrete re-inforcing bars has been declining steadily during the past few months, as the demands of the construction program tapered off. Output is currently estimated at about 75,000 tons a month. Average monthly production was 150,000 tons in 1942.

✦ ✦ ✦

IN order to divide equitably the tonnage of bars which will be produced, rail re-rolling mills are limited by the directives to an operation not exceeding forty hours per week per mill. Mills in the three western states were not required to cease production of concrete bars because rail steel production facilities in that area are small. Mills in the other states

prevented from making concrete re-inforcing bars, of course, will use their facilities for other steel semi-finished and finished products.

✦ ✦ ✦

Conservation Order M-261 Strapping for Shipping Containers

"STRAPPING" means any iron, steel or other metal wire or band reinforcements or closures, twelve (12) inches or more in length, for shipping containers or for fastening of material into bundles, excepting: metal for barrel hoops, stitching, baling of compressed material, or for fastening or blocking of material to skids or in vehicles or vessels.

✦ ✦ ✦

Restriction on Use of Strapping

NO person shall use commercially any strapping unless:

✦ ✦ ✦

(1) The weight of the container and contents, or bundle on which the strapping is used, exceeds 90 pounds, or

(2) The net weight of the contents of the container or bundle exceeds .058 pounds per cubic inch, or

(3) Use of the strapping is required by regulation or order of the Interstate Commerce Commission, or

(4) The container for which the strapping is used, and its contents, are to be delivered to or for the account of the Army, Navy, Maritime Commission, or War Shipping Administration, and the strapping is required by such agency, or

(5) The shipment is for delivery outside of both the United States and Canada, or

(6) The strapping is for wooden shipping containers of fresh fruits, vegetables, meats, fish or poultry, provided the strapping is essential to the safe delivery of the contents and has been customarily used for the same type of shipment and container, or

(7) The strapping is for wooden lard or butter tubs, and wooden buckets or pails, or

(8) The strapping is for closing fibre drums or hexagonal or octagonal fibre containers.

✦ ✦ ✦

Applicability of Priorities Regulations

THIS order and all transactions affected thereby are subject to all applicable provisions of the priorities regulations of the War Production Board, as amended from time to time.

✦ ✦ ✦

Copper

THE following statement was made recently by H. C. King, Director of the WPB Copper Division:

✦ ✦ ✦

"RECENT statements quoted in the press have conveyed the impression that the supply of copper is adequate to meet all military and essential civilian requirements. Widespread acceptance of such statements would constitute a threat to our entire war production program. The supply of copper is not adequate and never will be while this war is on.

✦ ✦ ✦

"A NUMBER of WPB limitation orders have eliminated the use of copper from thousands of civilian products. The Army and Navy have saved considerable

(*Please turn to Page 176*)

To Insulated Wire and Cable Manufacturing Executives and Plant Engineers

A factual engineering manual covering lacquer and varnish impregnation of insulated wire and cable is now ready for distribution.

It covers in detail, the most important phases of impregnation, insulation and finish drying of wire and cable along with a description of the basic types of payoff and windup equipment.

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The **INDUSTRIAL** *Oven Engineering* **COMPANY**

Engineered Industrial Ovens • Special Handling Equipment • Contract Engineering

GRANADA BLDG.

11621 DETROIT AVE. **CLEVELAND, OHIO**

Government Wire Production Information

(*Continued from Page 175*)

amounts of copper by reducing their requirements wherever possible. A vigorous program of substitution has been carried on.

✦ ✦ ✦

"FURTHER, several hundred million dollars are being spent on facilities for new projects to increase primary production, while scrap programs have resulted in the collection of twice the tonnage which was expected at the beginning of 1942. Because some of these efforts have been successful, and have resulted in a reduction of the overall deficit is no reason for the relaxation of restrictions on use, or relaxation of our efforts to acquire every pound of copper wherever it is available."

✦ ✦ ✦

Steel Plate Shipments

STEEL plate shipments during the year 1942—approximately double the 1941 production—set a new annual record, the Director of the Steel Division announced recently.

✦ ✦ ✦

DURING the past year, 11,809,938 net tons of steel plates were shipped. Most of this tonnage was used for shipbuilding and other urgent war requirements, the remainder going to essential civilian needs such as railroad equipment and for export. Of this total, 5,194,022 net tons were produced on the country's continuous strip mills, converted to plate production to meet the greatly increased war needs.

✦ ✦ ✦

THE 1942 tonnage compares with total plate shipments of 5,986,535 net tons in 1941. This latter figure was the previous annual record. The highest total for the first World War was 5,119,908 net tons in 1918.

✦ ✦ ✦

IN the month of December, plate shipments totalled 1,060,039 net tons, of which 490,487 net tons were produced on strip mills. The record month thus far was in July, when 1,124,118 net tons were shipped.

✦ ✦ ✦

NEW mills, capable of producing approximately 150,000 net tons per month, are under construction and will become available in the latter part of the second quarter of the year.

✦ ✦ ✦

Lead

LEAD supply in 1943 is expected to be somewhat below 1942 supply, the decrease being both in imports and domestic mine production, the Director of WPB, Tin-Lead Division, told the Lead Producers Industry Advisory Committee meeting recently in Washington. This 1943 total supply will cover presently known requirements, and leave a margin for stockpile, he said, though additional substitution of lead for other more critical materials might cause a curtailment of less essential uses.

Ships on the Production Line

ACP Products save time and step-up efficiency in Navy and private shipyards

Just as ACP DEOXIDINE helped make the mass production of automobiles possible . . . and as ACP RODINE boosted the efficiency and volume of steel production . . . so, today, these and other ACP Products are helping build the vital bridge of ships.

RODINE in pickling baths, saves both steel and acid and prevents pitting and burning of plates. It minimizes acid embrittlement, making plates easier to machine, bend and drill. DEOXIDINE is the time-tested acid cleaner. On aluminum ventilating ducts and superstructure sections, it removes oil, eradicates corrosion and neutralizes corrosion-producers. LITHOFORM chemically coats galvanized surfaces to prevent the characteristic blistering and peeling of paint.

All three have long served their apprenticeship with the growth of American Industry.

•

Among the other ACP Products are: FLOSOL, an exceptional soldering flux for steel, brass, copper, tin, terne plate, zinc and galvanized iron; KEMICK, a chemical paint that holds to and protects metal surfaces even when heated to redness; CUPRODINE copper coats steel by simple immersion.

These and other ACP Products are available to you in speeding production of the vital bridge of ships. The experience of the ACP laboratories in metal treating and finishing processes is at your service.

AMERICAN CHEMICAL PAINT CO.
MAIN OFFICE AND WORKS
AMBLER · · · PENNA
ACP
CHEMICALS ACP PROCESSES
DETROIT, MICH., 6335 Palmer Ave., E.
CANADIAN BRANCH
WALKERVILLE · · · ONT

LEAD will not be imported from Canada and Australia in 1943 as has been done previously, which will reduce total imports considerably under last year. South American lead imports are taking second place in shipping to more critical material and it cannot be stated just how much lead may be received from this source.

✦ ✦ ✦

DOMESTIC mines and smelters will have great difficulty maintaining production at the same rate as in 1942, producers said, though no serious decreases need be feared. Labor and materials for operations in both mines and smelters are the critical factors, they said.

✦ ✦ ✦

SUBSTITUTION of lead for other more critical metals in war production as well as in essential civilian products was discussed, reports being submitted showing the degree of progress in several such substitution attempts.

GOOD success is reported in substituting lead for more critical materials in the following products: building materials, lead protective coatings for steel and other metals particularly to relieve zinc, high-lead bearing metals and solders, caskets, chemical plant equipment as a replacement for rubber, paint containers (foil lined) instead of steel, gaskets and washers to replace rubber, pigments to replace other metallic pigments, and instruction plates. Work continues to be done to develop uses where more critical metals are now used.

✦ ✦ ✦

Fluorspar

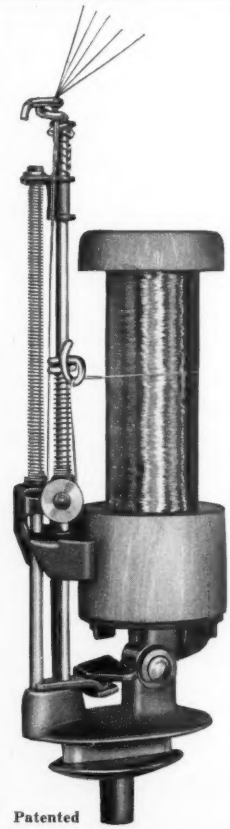
AT least five new producers of metallurgical grade fluorspar are expected to come into production in 1943 according to present plans, which should add another 60,000 tons of this critical material to the supply available to the Nation's steel mills, it was revealed recently at a meeting of the Fluorspar Producers Industry Advisory Committee in Washington.

✦ ✦ ✦

REPORTS just completed showed that the production of metallurgical grade dropped 15 per cent in December from the previous months, it was announced. While this decline is serious, it was not unexpected, for unless some way is found to provide adequate manpower for the mines, a continuing decline in production must be expected.

✦ ✦ ✦

MANPOWER, operators said, continues to be their major production problem. WPB some months ago called attention to an impending 1943 shortage of 50,000 to 100,000 tons principally as a result of insufficient mine labor, and instituted a conservation program among steel mills to reduce consumption. A saving of from 10 to 15 per cent of former use is hoped for.



Patented
2 BX - Special
MOSSPEED Carrier.

MOSSPEED BRAIDER CARRIERS
FOR BRAIDING
MULTIPLE ENDS OF FINE WIRES

A special design MOSSPEED CARRIER and BOBBIN is supplied for braiding "SHIELDED" WIRE & ETC.

Will braid multiple ends of fine aluminum, brass, bronze or copper wire, Etc.

SHEAVE-WHEEL on braider-stop and SPECIAL-THREADEYES on carrier, together with new type BOBBIN provides an even wire "let-off" resulting in a high quality and uniform braided shield.

Consult our engineers regarding your braiding problems.

MOSSBERG
Pressed Steel Corp.
18 West Street
Attleboro, Massachusetts, U. S. A.
European Agent
James Day (Machinery), Ltd., The Grange, Whetstone, Nr. Leicester, England
Ross Whitehead & Co., Ltd., Montreal and Toronto, Canada.

Relative Workability of Metals

(*Continued from Page 167*)

A + KR when the yield point increases linearly with reduction.

✦ ✦ ✦

Relative Workability of Some Ductile Metals

RODS from various metals have been drawn into wire by the same method as that which was used for copper. The data obtained were worked up in a similar manner to that shown in the foregoing section. For a chosen standard diameter a number of curves giving the relationship between the energy required to deform a unit quantity of metal, and the amount of deformation given were obtained. In all cases this relationship can be described, within the experimental uncertainty, as: $\frac{E}{d} = A + B\sqrt{S}$ where E = energy, d = draft, S = state of metal at the beginning of any draw. A and B are constants for any given metal. The equation is subject to the following restrictions: 1) There is a definite (and determined) effect of size of diameter. 2) All drafts used must be essentially of the same magnitude, otherwise the left term of the equation probably takes the form $\frac{E}{d(1-\frac{d}{100})}$. This effect of the size of draft probably is due to resulting variation in temperature of the metal. 3) The speed of drawing must be constant, otherwise the temperature of the metal may vary. 4) The die friction must be kept uniform.

✦ ✦ ✦

THUS under standard condition for a standard diameter wire, where the die friction is kept low and constant, and the temperature of the metal is kept fairly constant, the values of A and B obtained must be closely related to properties of the metal.

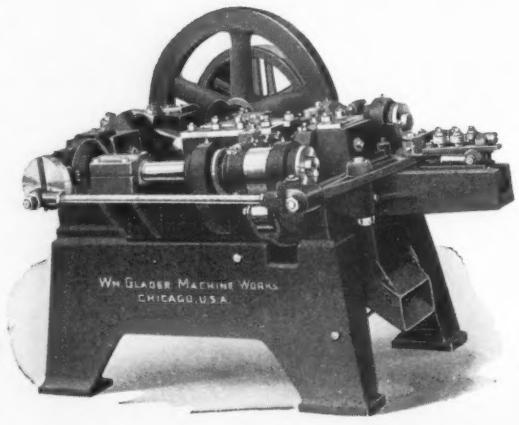
✦ ✦ ✦

In the following table is found the equations obtained for a number of metals. The first column shows the effect of size of diameter. In the second column the energies are given as in. Lb per cubic inch, and in the third column the energies are stated as Ft lb per Lb. The fourth column gives the relationship between B and A as 100 B/A according to the equation $E/d = A(1 + B/A\sqrt{S}) \times (1 + FD)$. It is seen that this ratio expresses the relative hardening effect in percent. of original state, of the cold drawing processes for the various metals. The inverse of this ratio may serve as a relative measure of ductility.

✦ ✦ ✦

RECALLING that A in the second column of Table II expresses the force required per inch square as well as the energy per cubic inch, it is interesting to note that this term A therefore must be closely related to the yield points of the metals. Moreover, there is a distinct relationship between the magnitude of this term and the atomic radii of the unalloyed metals. This may

HIGH SPEED WIRE NAIL MACHINE



WM. GLADER MACHINE WORKS

210 N. Racine Ave. Chicago, Illinois

Glader Machines on large head, single-blow roofing nails can be seen in operation at any of the independent wire mills in the United States.

The production figures on common nails shown below, are guaranteed.

SIZE MACH.	SIZE WIRE	MAX. LENGTH OF WIRE	NUMBER OF NAILS PER MIN.	CAP. IN POUNDS PER HR.
#00A	#16	1⅛"	700	37.2
#00	#14	1¼"	550	55
#0	#12	1¾"	450	89
#1	#10	2½"	400	192
#2	#8	3½"	325	310
#3	#4	5"	225	523
#4	#1	7"	190	622
#4s	5/16"	9"	175	1155
#5	⅜"	12"	160	2400

This high output and economical operation account for the GLADER machine being accepted as standard equipment in all recent installations.

be seen from Table III and Fig. Nos. 5 and 6.

✦ ✦ ✦

THERE is also a relationship between the hardenability factor B^1 expressed in terms of weight of metal. This is shown in Fig. 6. A similar relationship is found between the melting points and B/N where B is in terms of cubic inches, and N is the atomic number.

Acknowledgment

The author wishes to express his thanks to the Phelps Dodge Corporation and to Mr. Wm. H. Osborn, Director of the Phelps Dodge Corporation Department of Development & Research, in whose laboratory experimental work was carried out. ✦ ✦ ✦ ✦

Book on Substitutes

AN important and timely book "SUBSTITUTES" by **H. Bennett**, was published by the **Chemical Publishing Company, Inc.**, Brooklyn, New York, early in 1943.

✦ ✦ ✦

IT describes new products, processes and materials to be used as substitutes and alternatives for the numerous raw materials which have become unavailable because of the war.

✦ ✦ ✦

THE author is an expert in this field. He has not only given of his wide knowledge of substitutes for numerous products, but has also included the results of the experience of many chemists, engineers, and technical workers.

✦ ✦ ✦

THIS book should be interesting to all branches of industry where shortages are an every-day problem.

✦ ✦ ✦

THE contents include substitutes for metals, plastics, textiles, rubber, chemicals, drugs, resins, waxes, paints, oils, fats and many other products. A plan is also given showing how to determine whether a substitute material is suited to a new use and whether it will stand up under conditions of marketing and use. The book is priced at $4.00.

Welding and Brazing Booklet Revised

THE Aluminum Company of America has completely rewritten and revised its booklet on aluminum welding and incorporated in it a new chapter on the art of brazing aluminum. The book is comprised of 100 pages of text and illustrations and a color chart showing the proper flame adjustments for different applications.

THE contents covered are gas, arc and resistance welding, inspection and specifications, and furnace, torch and dip brazing, incorporating information on the preparation of surfaces prior to and the cleaning of joints after brazing.

✦ ✦ ✦

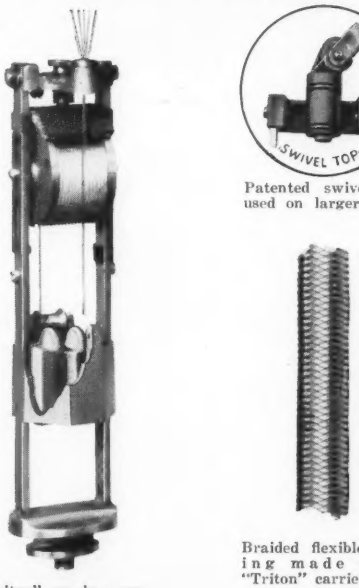
THIS handbook on welding and brazing will be sent to any of our readers desiring a copy. Write to the Aluminum Company of America, at Pittsburgh, Pa.

"TRITON" HIGH CAPACITY WIRE CARRIERS

For Precision Hard Wire Braiding, Hydraulic Flexible Tubing, Hose and Electric Cables

Patented swivel top used on larger sizes

Braided flexible tubing made with "Triton" carriers.



"Triton" carriers are patented in all principal countries.

Note the loose weights supplied in the tension box.

The latest development in wire braiding is our new carrier. Can be used on most braiding machines. New principles increase output without change in running speeds. Perfect control makes for precision braiding at all speeds. Accurately and sturdily made.

Let us quote prices. Send us your horngear size depth and profile of track and number of gears and carriers. Catalog No. 10/4 will give description and specifications of all Carter carriers. We shall be glad to send you a copy.

SOLE MANUFACTURERS

B. & F. Carter & Co., Ltd., Bolton, England

ALBION WORKS • WATERLOO STREET

MACHINERY FOR BRAIDING, TUBING, INSULATING CABLES, ETC.

A Review of Recent Wire Patents

No. 2,307,133, WIRE STRAIGHTENER, patented January 5, 1943 by Charles D. Johnson, Worcester, Mass., assignor to Johnson Steel & Wire Company, Inc., Worcester, Mass., a corporation of Massachusetts.

A number of wire straightening rolls are provided, ball-bearing mounted, and carried by two roll blocks.

✦ ✦ ✦

No. 2,307,588, INSULATED ELECTRICAL CONDUCTOR, patented January 5, 1943 by Edward H. Jackson and Ralph W. Hall, Fort Wayne, Ind., assignors to General Electric Company, a corporation of New York.

About the wire conductor is insulation comprising a heat-hardenable phenol-aldehyde-modified polyvinylal resin heat-treated in place to produce a hard, flexible, tough, abrasion-resistant insulation.

✦ ✦ ✦

No. 2,307,925, WIRE COATING APPARATUS, patented January 12, 1943 by Alvin N. Gray, Joppa, Md., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

In this apparatus, where the wire supply spool and wire take-up spool are inaccessible to each other, manually operable means is provided, accessible from either side of the coating apparatus, for controlling both spools.

Complete Descriptions and Drawings of Patents May Be Had for 25 cents. Address, Wire & Wire Products, 300 Main St., Stamford, Conn.

✦ ✦ ✦

No. 2,308,274, ARMORED CABLE, patented January 12, 1943 by Otto A. Frederickson, Glen Ridge, N. J., assignor to National Electric Products Corporation.

A jacket of metal foil is disposed beneath and in contact with the armor to form a ground.

✦ ✦ ✦

Reissue No. 22,252, METHOD OF MAKING COILED COILS, patented January 19, 1943 by Raymond H. Beebe, Bridgeport, Conn., assignor, by mesne assignments, to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., a corporation of Pennsylvania.

Coiled-coil wire filaments are made by forming a helix in a die and applying force against the turns of the helix to produce a second helix.

No. 2,308,700, METHOD OF TREATING FABRICATED TUNGSTEN WIRES OR RODS, patented January 19, 1943 by William E. Mansfield, Garfield Heights, Ohio, assignor to Cleveland Tungsten, Inc., a corporation of Ohio.

The wire, in its ductile state, is heated to 900° to 1400° C in a nonoxidizing atmosphere for sufficient time to cause sufficient dispersion of the grain structure of the tungsten to render it nonductile and to provide a substantially uniformly dispersed tungsten grain structure in which the tungsten grains are not substantially larger than in standard ductile tungsten.

✦ ✦ ✦

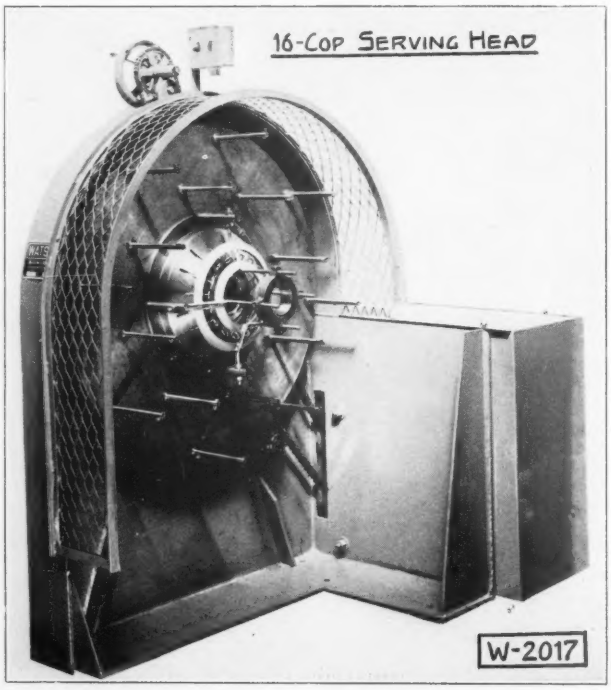
No. 2,308,772, WIRE SPRING BACK CONSTRUCTION FOR UPHOLSTERED FURNITURE, patented January 19, 1943 by William H. Neely, Cleveland, Ohio, assignor, by mesne assignments, to John C. Lincoln, Scottsdale, Ariz.

This assembly includes a number of elongated wire springs, extending crosswise of the frame, connected together with lengthwise-extending wires, provided with reversely-arranged U-shaped portions.

✦ ✦ ✦

No. 2,308,905, BARBED WIRE, patented January 19, 1943 by Harold Athelstane Abbott, Bendigo, Victoria, Australia.

THE WATSON MACHINE COMPANY
PATERSON, NEW JERSEY, U.S.A.
ELECTRICAL WIRE AND CABLE AND WIRE ROPE MACHINERY



SERVING HEADS

16-COP UNIT SHOWN HERE PROVIDES FOR:—

2½ LB. COPS
(4¼" x 6" x 9/16")

240 Head R.P.M.

Reversible Reeves Drive

3" DIA. PASSAGE

AUTOMATIC STOP

SIGNAL LIGHT

Along the strand main wire are spaced pairs of oppositely-disposed kinks and pairs of barb-forming wires associated with each pair of kinks locking the sections to the main wire and providing two barbs.

✦ ✦ ✦

No. 2,308,914, SCREW AND THE LIKE, patented January 19, 1943 by Alfred Gerhold, London, England.

The shank is provided with a slow main thread, of uniform pitch, and a bulbous cutter end, having a fast thread of steep pitch.

✦ ✦ ✦

No. 2,308,975, FLEXIBLE ELECTRIC CONDUCTOR, patented January 19, 1943 by Johannes Hoekstra and Joseph Eugene Huber Rieter, Eindhoven, Netherlands; vested in the Alien Property Custodian.

An insulating coating for the wire is provided, comprising chlorinated rubber and a water-resistant softening agent, the quantity and composition of the softening agent being such as to make the coating elastic and the quantity lying between 35% and 60% by weight of the quantity of chlorinated rubber.

✦ ✦ ✦

No. 2,309,053, APPARATUS FOR AND METHOD OF MAKING BLANKS FOR SELF-TAPPING SCREWS, patented January 19, 1943 by James J. Farrell, Scotia, N. Y., assignor to General Electric Company, a corporation of New York.

This invention embodies a closed-type header die for forming a screw blank by upsetting.

✦ ✦ ✦

No. 2,309,057, APPARATUS FOR ENAMELING RECTANGULAR WIRE, patented January 19, 1943 by Edward J. Flynn, Schenectady, N. Y., assignor to General Electric Company, a corporation of New York.

A die is provided, with a rectangular wire passage and openings interconnected with this passage at the corners thereof and adapted to apply coating material to the edges of the wire.

✦ ✦ ✦

No. 2,309,164, SPRING UNIT AND METHOD OF CONSTRUCTING THE SAME, patented January 26, 1943 by Gorman C. Burd, Adrian, Mich., assignor to The Owen Silent Spring Company, Inc., a corporation of Connecticut.

The unit comprises a number of interconnected upright helical springs, including an encircling series of helical springs integrally connected alternately at the top and bottom of the unit by diagonal connections, and horizontal frame members exterior of this series around which the connections pass.

✦ ✦ ✦

No. 2,309,239, SPRING STRUCTURE, patented January 26, 1943 by William Clark, Detroit, Mich., assignor to L. A. Young Spring and Wire Corporation, Detroit, Mich., a corporation of Michigan.

Body wire springs and helically coiled wire springs are provided, clipped together and to the body springs, with wire clips.

No. 2,309,570, SEAT CUSHION, patented January 26, 1943 by Henry C. Borisch, Milwaukee, Wis., assignor to Nash-Kelvinator Corporation, Kenosha, Wis., a corporation of Maryland.

The exterior walls of the cushion are of rubber, with the inner surface of the top wall provided with pockets adapted to receive the ends of coil springs.

✦ ✦ ✦

Army-Navy "E" Awarded to Fidelity

THE **Fidelity Machine Company** of Philadelphia, Pa., was formally presented with the Army-Navy Production Award for Excellence in War Production in an appropriate ceremony held at their Frankford Avenue Plant on February 20th, 1943.

✦ ✦ ✦

WELL known to the wire industry as designers and builders of automatic precision wire spooling, braiding and other special machinery, **Mr. H. W. Anderson**, President and General Manager, and his fine organization of skilled artisans, are to be congratulated for the high standards of production that have merited the coveted "E".

"Here's the Die THAT WILL INCREASE YOUR WIRE PRODUCTION!"

To increase production in the face of today's shortages of labor and machines, make sure your present machines are producing at capacity. Start checking with your dies, because, to an important degree, they control the quantity and quality of your wire output.

TECO Carbide Dies produce more tonnage per machine, more tonnage per man-hour. And it's all high quality tonnage, held to accurate tolerances and unblemished finish through every pound of production. TECO Carbide Dies give you longer service because they are made to rigidly controlled standards of uniformity, density and hardness, reducing wear and friction to a minimum. Our engineers will gladly discuss your needs.

WIRE and BAR DIES
EXTRUDING DIES
TUBING DIES
SIZING DIES

Also Carbide Blanks, Tools, Bits, Reamers and Forming Tools.

TUNGSTEN ELECTRIC CORPORATION
564 39th Street, Union City, N. J.
Branch Office: 2906 Euclid Avenue, Cleveland, Ohio.
Representative: Architects & Builders Bldg., Indianapolis, Ind.

TECO Pioneers in Tungsten Carbides for over a Quarter Century CARBIDE DIES

Outstanding Personalities of the Wire Industry

C. Eric Rigby

IT is with regret that we note the passing of **C. Eric Rigby**, who died recently at the age of 48 at his home "Kelvindale", Oakfield, Sale, Ches., England.

✦ ✦ ✦

MR. RIGBY was Director and Secretary of John Rigby & Sons, Ltd., which office he held at the time of his death. He was also a Director of Thomas Wood & Son (Heckmondwike) Ltd., H. P. Tay, Ltd., and Lavite, Ltd., and was active in the Iron and Steel Wire Manufacturer's Association and the British Steel Wire Industries Association.

✦ ✦ ✦

RECENTLY elected a Director of John Rigby & Sons, **Mr. Walter Wright** has been appointed as successor to the late Mr. Rigby.

A. F. Dobbrodt, Southern Dist. Mgr., Carboloy Company, Inc.

THE appointment of **A. F. Dobbrodt** as Southern District Manager for Carboloy Company, Inc., has been announced by **K. R. Beardslee**, General Sales Manager.

✦ ✦ ✦

MR. DOBBRODT, who will make his headquarters at 1719 Comer Building, Birmingham, Alabama, has been with the Carboloy Company since 1929, his activities covering design, sales and servicing of cemented carbide tools in the Chicago, Milwaukee, Rochester, and Cleveland areas.

✦ ✦ ✦

HE is a graduate of Lane Technical High School and the Estes Management Foundation Course in Industrial Management. Prior to joining the Carboloy Company, he served his apprenticeship as tool maker, tool room foreman and tool designer.

✦ ✦ ✦

THE territory coming under the direction of Mr. Dobbrodt includes Tennessee, Florida, Mississippi, Alabama, Texas, Georgia and Louisiana.

✦ ✦ ✦

F. B. Lounsberry, Vice Pres. Chg. Mfg., Allegheny Ludlum Located At Brackenridge

F. B. LOUNSBERRY, vice president in charge of manufacturing for all plants of the Allegheny Ludlum Steel Corp., will henceforth make his headquarters at the company's general offices in Brackenridge, Penna.

THE WIRE ASSOCIATION

What It Gives You for $10.00 Annual Dues

1. **WIRE & WIRE PRODUCTS —For One Year.**
   The official publication of The Wire Association covering the Wire Industry; its Metallurgy, Technology, Research, Processes, Machinery and Personnel.

2. **THE ANNUAL BUYERS GUIDE & YEAR BOOK OF THE WIRE ASSOCIATION.**
   The Year Book Section contains: Constitution and By-Laws of The Wire Association; Details of year's meetings, etc.; List of Members, Index to Papers and Articles in WIRE & WIRE PRODUCTS.

3. **QUESTION AND ANSWER SERVICE.**
   Answers to technical and operating problems direct by mail. Available to members only.

4. **ANNUAL CONVENTION AND EXHIBITION.**
   (In Association with American Society for Metals and The National Metal Congress.) Technical Sessions, Plant Inspections.

5. **REGIONAL MEETINGS.**
   Attendance at the regional meetings which include Local Plant Inspections, Technical Sessions and Discussions.

6. **PERSONAL CONTACTS.**
   Both at Annual and Regional Meetings, and throughout the year, for interchange of helpful information.

7. **INFORMATION SERVICE ON MACHINERY, EQUIPMENT AND SUPPLIES.**
   The Technical, Catalogue and Correspondence Files of the Wire Association hold the answer to practically every "Where can I buy" problem. This service is available to members without charge.

For detailed information address

RICHARD E. BROWN—Executive Secretary

300 Main Street — Stamford, Conn.

N. W. Pickering Resigns Presidency of Farrel-Birmingham Company

CAPTAIN Nelson W. Pickering, USNR, was ordered to report for active duty in the United States Navy on February 1, and accordingly has resigned as President of Farrel-Birmingham Company, Inc., of Ansonia, Connecticut and Buffalo, New York. Captain Pickering has been assigned to duty as Commander of U. S. Navy Section Base at New London and commander of local defense forces in that area.

✦ ✦ ✦

BEFORE coming to Farrel-Birmingham Company in 1919, Captain Pickering served for fifteen years in the Navy. After his graduation from the United States Naval Academy in 1908, he was assigned to sea duty, and subsequently was selected for post graduate instruction in ordnance engineering, which included duty at the Naval Gun Factory, Washington, D. C., the proving ground at Indian Head, Maryland, and the Bethlehem Steel Company. He then was sent to England to complete the instructional course at Barr Stroud Optical Works, Glasgow, Scotland, and the Whitehead Torpedo Works, Weymouth, England. Following another tour of sea duty, devoted primarily to gunnery work, he served as Chief of Gun Section, Bureau of Ordnance, Navy Department, which post he held through the early part of the World War. Upon completion of this duty he was assigned to duty overseas in connection with ordnance matters pertaining to heavy gun construction and liaison work with the Naval railway batteries in France. After the Armistice he served for a year as gunnery officer of the U.S.S. North Dakota.

✦ ✦ ✦

IN 1919 he resigned from the Navy and started work in the Roll Department of Farrel Foundry & Machine Company, becoming, successively, assistant manager and manager of that department. In February, 1930, he was elected President of Farrel-Birmingham Company, Inc., with executive direction of the company's three plants.

✦ ✦ ✦

Poster for Carbide Tools

TO aid in the further education of workers in the proper handling of cemented carbide tools, the **Vascoloy-Ramet Corporation** of North Chicago, Ill., has prepared a jumbo size wall chart, graphically portraying four simple ways to get longer life from these tools.

✦ ✦ ✦

THE poster was prepared in response to the request of the W.P.B. for simple visual educational posters to assist workers in war industries.

✦ ✦ ✦

COPIES of this poster will be mailed free by the Corporation to interested parties requesting it.

ROBINSON TUBE-TYPE WIRE STRANDERS

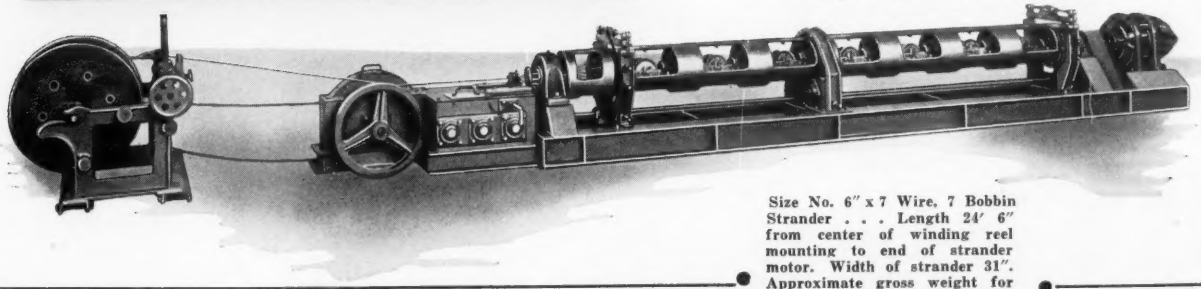
Dynamically Balanced! No Vibration!

ADJUSTABLE CRADLE MOUNTINGS

IN this new Robinson Tube-Type Wire Strander are embodied the suggestions of engineers and operators of numerous wire cable plants throughout the country. As a result of careful study and field contact, this machine now meets the most exacting requirements of the industry. Frame, main and take-off bearing mounts, gear housing and base are of all-welded construction—as structurally stable as though cast in a single unit. Steel tube of high tensile strength is statically and dynamically balanced. Gear box is designed to produce any lay within the range of lays required for its size and type. All high-speed gears are fully enclosed; they operate in a continuous oil bath. Supporting rollers of the best quality highly compressed fibrous material are mounted on spindles running in adjustable ball bearings. Bobbin latches and bobbin brakes are of new design and semi-automatic in operation.

Full information available upon inquiry. Your priority rating may permit of immediate consideration.

Write for Illustrated Manual



Size No. 6″ x 7 Wire, 7 Bobbin Strander . . . Length 24′ 6″ from center of winding reel mounting to end of strander motor. Width of strander 31″. Approximate gross weight for domestic shipment 3,000 lbs. Reel stand shipping wgt. 450 lbs.

ROBINSON MANUFACTURING COMPANY

30 CHURCH STREET, NEW YORK, N. Y.

WORKS:—MUNCY, PENNA.

UNIQUE

Some Electrical Developments Of 1942

By Guy Bartlett,

General Electric Company, Schenectady, N. Y.

THE whole story cannot be told. All the activities of the electrical manufacturing industry are being directed to producing for the war at sea, for the war on land, and for the war in the air, both in direct production and in supplying essential tools to other war industries. Not until the victory has been won can the brilliant achievements of electrical manufacturers during 1942 be revealed—achievements made possible by the combined all-out war-production efforts of research, engineering, and manufacturing personnel.

✦ ✦ ✦

PRODUCTION lines which previously turned out many thousands of fractional - horsepower motors still produced small motors, a great many of them were of different kinds, frequently for direct-current use and with unusual characteristics requiring unique design and new material. Previously the motors had been required for domestic refrigerators, oil-furnace equipments, washing machines, vacuum cleaners, air-conditioning units, and the many others of the multitude of appliances and home equipments that had contributed so much to the American standard of living. Now they were needed for quite different applications in airplanes, tanks, ships, and the many other types of war equipment.

✦ ✦ ✦

OTHER production lines — for controls, heating appliances, meters, and on down through the list — were likewise converted to increased production of similar, or even radically different, equipments needed by the armed services.

ELECTRICAL as well as other manufacturers cut off whole production lines in certain instances and rushed into full production on new products, in some cases new even to the necessity of invention and development of the product in question. Production quotas went up — doubled, redoubled — and were met; in ever increasing quantities the electrical industry and its subcontractors turned out their contributions for victory. The products were of great variety and the quantities tremendous by comparison with any known standard variety—it is quite likely that no other manufacturer turned out as great a variety of technical items directly needed in the war.

✦ ✦ ✦

THE development of new and improved products was not the only matter to occupy the attention of engineers during the year. Even before the start of the war, attention was being devoted to

NEW HORIZONS

THAT ADVERTISING WILL HELP TO ACHIEVE

As we drive forward toward Victory it is time to start planning for post-war business. The challenge is before every one now making the tools of war. The kind of future we will enjoy is squarely upon our industrial leaders, large and small—upon the management of every business enterprise.

Those who advertise tell the world of their faith and hope—and the expression of confidence contributes to the end desired—free enterprise, opportunity for initiative, and the utilization of new products, processes and machinery. These are the men whose prestige is kept solid, whose basis for the future is firm.

Your advertising can be helpful, informative, useful. You may have to struggle with priorities, allocations, reports and war-imposed regulations for some time, but looking ahead, starting to prepare now, will help you and your customers to attain the visions now on the horizon to which we all aspire.

Advertise to reach the WIRE INDUSTRY in

WIRE & WIRE PRODUCTS

300 Main Street Stamford, Conn.

Official Publication of the Wire Association

finding alternate materials to replace rubber, tin, aluminum, and all the other materials which had become precious. Brilliant results were attained in many such substitutions, and it is safe to predict that the changes effected will in many cases remain even after the war is won and the original materials are again available, for the new materials have been found to do the job better without increased cost, to do the job just as well at less cost, or even to do a job that could not be done before.

✦ ✦ ✦

IN the manufacture of searchlights, a redesign permitting the substitution of steel for aluminum saved much of the scarcer material, with but little increase in total weight.

✦ ✦ ✦

HUNDREDS of thousands of pounds of nonferrous metals were saved in power-switching equipment alone by design modifications leading to reduced use of critical materials. And just as this type of equipment was redesigned, so were other products modified to save material.

✦ ✦ ✦

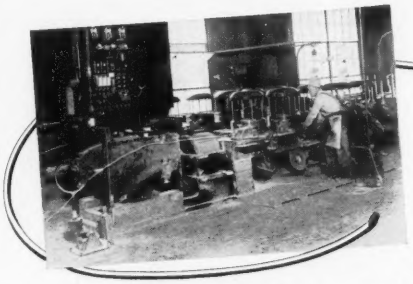
STANDARDIZATION of design also played a most important part during the year in speeding production of needed equipment. Practically no two large turbines were made alike previously. By adopting a standardized design of ship-propulsion turbines, however, it was found possible to complete the units in far less time, at lower cost.

✦ ✦ ✦

IT was not alone in direct war effort, however, that the electrical industry contributed to winning the war. In addition, it kept essential electric products flowing to other industries which in turn were producing for victory. Central stations required additional generation and distribution capacity; industries needed power distribution systems and drives for their machines; and transportation companies had to have more

(*Please turn to Page 186*)

Good thru the Last Pass



Magnus 52-C-1 for High Carbon Wire

When you're after speed in multipass drawing of high carbon steel wire, it isn't difficult to get your speed on the first five passes. It's the last passes that count.

Magnus 52-C-1 insures increases in speed on drawing this type of wire up to 40%, because it carries through to the last draw, with perfect lubrication *all* the way.

We'll be glad to send a liberal sample for tests, if you are interested.

GET THE DETAILS

Ask us to tell you the complete story. How the men on the machines, in plant after plant have *no* faults to find with this material. How some of them claim they can run scratched wire through again with 52-C-1 and turn out a perfect wire.

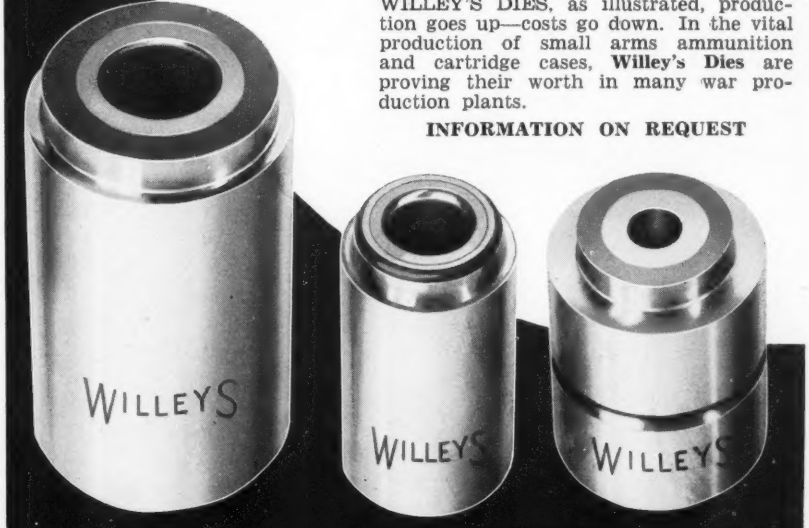
MAGNUS CHEMICAL COMPANY
Manufacturers of Cleaning Materials, Industrial Soaps and Metal Working Lubricants.
188 South Avenue Garwood, N. J.

Magnus CLEANERS

Many Times Greater Die Life by Using WILLEY'S DIES Made of WILLEY'S METAL

When you change from steel dies to WILLEY'S DIES, as illustrated, production goes up—costs go down. In the vital production of small arms ammunition and cartridge cases, **Willey's Dies** are proving their worth in many war production plants.

INFORMATION ON REQUEST



WILLEY'S CARBIDE TOOL CO.
1340 W. Vernor Highway. Detroit, Michigan

"There is No Limit to
American Resourcefulness
When it is Enlisted
For a Righteous Cause"

Warner Company

BELLEFONTE DIVISION

MANUFACTURER

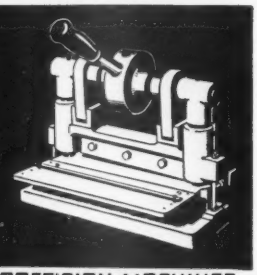
Bell-Mine Lime Products
For Use in Wire Drawing Processes

PLANT, BELLEFONTE, PA.

SALES OFFICES: PITTSBURGH, PHILADELPHIA, BELLEFONTE, N. Y. CITY

"Words Won't Win This War—Buy War Bonds"

SOLVE YOUR
"SHORT RUN"
DIE PROBLEMS
with DI-ACRO PRECISION MACHINES
(DIE-ACK-ROW)



SEND FOR CATALOG
"Metal Duplicating without Dies"
It's an eye-opener on what you can do without dies, shows typical parts, and gives sizes and capacities of all models of Di-Acro Shears, Brakes, Benders.

"Extra Special Rush! Speed it up! When can you deliver?" Maybe you don't have to wait — Wait — WAIT — for dies! Try "DIELESS DUPLICATING" with Di-Acro Shears, Brakes, Benders. These are *precision* machines — all duplicated work is accurate to .001". You'll get a new slant on "short-run" production problems from the great variety of parts which can be produced by Di-Acro Machines. Thousands of them are in use saving Man Hours and Critical Materials.

BENDERS
Di-Acro Bender bends angle, channel, rod, tubing, wire, moulding, strip stock, etc. Capacity — Bender No. 1 — 3/32", round cold rolled steel bar. Bender No. 2 — 1/2" cold rolled steel bar.

BRAKES
Di-Acro Brake forms non-stock angles, channels or "Vees". Right or left hand operation. Folding width — Brake No. 1 — 6". Brake No. 2 — 12". Brake No. 3 — 18".

SHEARS
(Illustrated)
Di-Acro Shear squares and sizes material, cuts strips, makes slits or notches, trims duplicated stampings. Shearing width — Shear No. 1 — 6". Shear No. 2 — 9". Shear No. 3 — 12".

O'NEIL-IRWIN DI-ACRO PRECISION MACHINES MFG. CO. 303 8th Avenue So., Minneapolis, Minn.

Some Electrical Developments Of 1942

(*Continued from Page 185*)

equipment with which to move both men and material.

✦ ✦ ✦

Cable

GAS-FILLED cable was extended to 69,000 volts with pressures of the order of 35 lbs. per sq. in., and to higher voltages with pressures in the order of 200 lbs. per sq. in. The first uses a reinforced or high-strength lead sheath, and the second employs a steel pipe. Low-pressure gas-filled cable previously was feasible to 34,500 volts.

✦ ✦ ✦

A NEW alloy sheath, with considerably greater mechanical strength was developed. Varnished-cambric cable with a synthetic sheath was found satisfactory up to 5000 volts and possibly higher for use where corrosive substances would destroy a lead sheath. Varnished-cambric cables with interlock armor finish were developed for use with load-center distribution systems; and synthetic-insulated bus drop cable was introduced to run from buses to industrial motors or other devices, greatly simplifying the electrical layout of such plants.

✦ ✦ ✦

Welding

AUTOMATIC equipment was produced for arc welding with heavily coated electrodes in cut lengths. For the Strikeasy arc welder there was introduced a crater filler—a foot-operated control to permit very close control of heat during the welding of thin material such as aircraft tubing and to permit tapering off the welding current at the end of a bead to fill the crater which otherwise is left. An all-position, high-quality a-c electrode was produced to extend the advantages and convenience of high-quality a-c welding to both vertical and overhead positions.

FOR resistance welding of heat-treatable steel alloys there was developed a special electronic control of such accuracy and flexibility that it was possible to control automatically both the magnitude of the welding current and the time of flow in order to control accurately not only the welding temperature but, even more important, the temperature for grain refinement or tempering, or both. A simple form of current regulator was applied in the seam welding of oil drums, holding the welding current constant regardless of variations in line voltage or the addition of magnetic materials in the throat of the welding machine.

✦ ✦ ✦

Steel Mills

UNPRECEDENTED demands for semifinished steel products led to rehabilitation of existing, and addition of many new, blast furnaces, open-hearths, coke ovens, and blooming, slabbing, plate, structural, and rod mills. Some cold-strip mills were built for rolling alloy steels, brass, and aluminum; but there was little expansion in equipment used for finished products.

✦ ✦ ✦

AMPLIDYNE control was applied in many new ways, to blooming mills, slip regulators, twin drives, plate mills, and hot- and cold-strip mills, with consequent higher speed, improved product, smoother control, and reduction in number of control devices needed. Hot-strip mills were changed over to roll plate.

✦ ✦ ✦

TO copper-oxide rectifiers was assigned the job of supplying low-voltage direct current for electrolytic tin plating, requiring only 1/3 of the tin needed in the older hot-dip process, and thereby conserving one of the most scarce of metals.

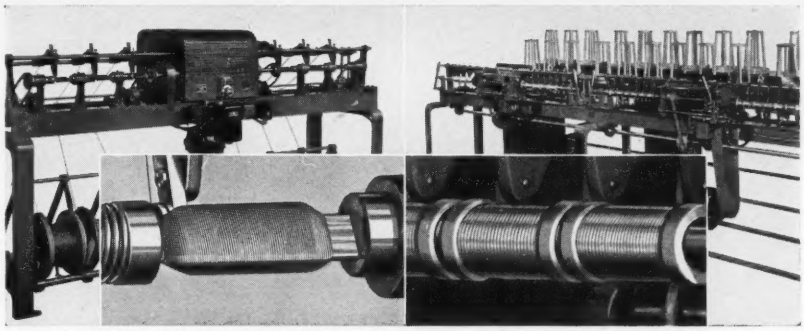
✦ ✦ ✦

Mechanical Measurements

A WIDE variety of new instruments was produced for different mechanical measurements

(*Please turn to Page 188*)

WIRE SPOOLING MACHINES



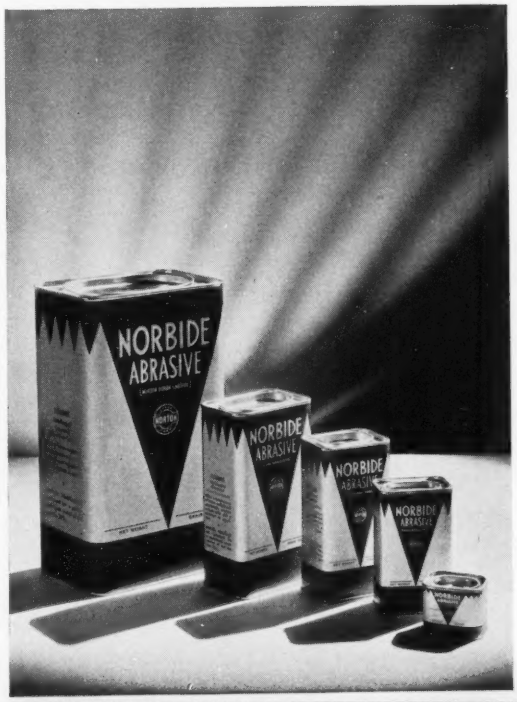
On Sticks or Spools . . . from Reels or Coils

Typical of FIDELITY Spooling Machines that you find serving every spooling-operation need of wire industry, these two new types command attention to advanced achievements in precision winding of the wire onto little flat sticks or conventional spools, at new high production rates and new low spooling cost.

You'll be interested especially in the new FIDELITY hydraulic control which eliminates gear changes . . . so write for Bulletin #61.

WIRE SPOOLING, TAPING, WINDING, SINFRA KNITTING, BRAIDING MACHINES

FIDELITY MACHINE COMPANY
3908-18 FRANKFORD AVENUE, PHILADELPHIA, PA.



NORBIDE ABRASIVE

For Cemented Carbide Dies

Used in place of diamond dust it reduces the cost of shaping, ripping and finishing.

NORTON COMPANY
WORCESTER, MASS.

N—38

NORTON ABRASIVES

Materials... Men... Machines... and

PRODUCTIMETERS

a partnership with but one purpose...to win the Victory! The times are tuned to "that which is essential." It is essential that exact records be kept on the production machines of the nation. It is essential that those production machines be equipped with Productimeters to assure accurate count. Ruggedly built to meet strenuous demands ...they prevent waste...conserve precious man-hours.

The line is complete, with models for measuring bare cable, insulated wire, armored cable, oily materials, etc. Wide range of speeds and capacities.

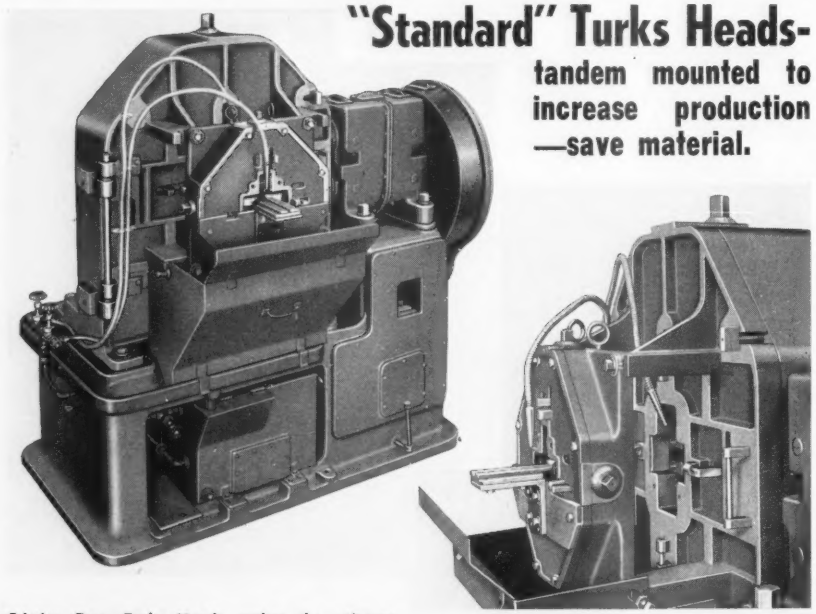
WRITE FOR CATALOG SECTION NO. 3

L-H-16-2, pictured, is popular for general all-around use. Lock Key Reset is guard against unauthorized setting. An accurate, sturdy unit for only $38.50. Wingnut Reset model, $35.00

DURANT MANUFACTURING COMPANY

1918 N. Buffum St., Milwaukee, Wis. 176 Eddy St., Providence, R. I.

PRODUCTIMETERS
THE SPEEDOMETERS OF INDUSTRY



"Standard" Turks Heads-

tandem mounted to increase production —save material.

Friction Type Turks Heads makes the primary reduction of the wire and acts as stock guide for the Power Driven unit which does the major forming of the section, and draws the wire through both units.

Advantages: 1. number of passes reduced—time is saved; 2. formed section held to closer tolerance—saving material while meeting rigid specifications; 3. production rates increased — roll maintenance decreased; 4. Formed wire can be coiled on a reel synchronized with Turks Head—or run into cut-off machine.

Write for NEW Turks Head Catalog —

STANDARD MACHINERY CO.

PROVIDENCE, RHODE ISLAND

Some Electrical Developments Of 1942

(*Continued from Page 187*)

and tests. An electronic flaw detector was introduced to quickly test nonferrous drawn-metal tubing for imperfections; a thickness gage to measure the thickness of electro-plating, paint or lacquer films on steel; a gage to check thickness of plastics, glass and other nonmetallic materials; a torsion meter unit, supported by flexible couplings, for measuring the torque transmitted to a shaft; and a direct-reading photoelectric tachometer, requiring no contact with the mechanism under test, for measuring rotating, reciprocating or vibration speeds.

✦ ✦ ✦

ASIDE from the tungsten filament, the incandescent lamp at the end of the year had no metal fabricated into the finished lamp that had not been changed. Brass bases gave way to brass-plated steel bases, iron and nickel-plated iron were used instead of the copper and nickel wires formerly employed, and much tin was released for war requirements by new formulas for solder. Approximately half of the lamp types were removed to effect maximum savings of critical materials; and the standard 100-watt filament lamp was reduced in bulb size, thereby conserving packing material and transportation cost, and enabling the design of smaller fixtures and reflectors.

✦ ✦ ✦

DEMAND for electric lamps continued at about the 1941 rate, with increased sales of high-wattage incandescent lamps and fluorescent lamps reflecting added night-time industrial activity as war production increased.

Remember Sam in the Sunday comics? All his experiences started with: "I seen yo' ad in de paper." YOU see the advertising of leading concerns in WIRE & WIRE PRODUCTS. When writing them, please say you saw their ad in WIRE & WIRE PRODUCTS. Advertising service is fundamentally American.

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YOU NEED ONE OF THE MANY

Porter Cutters

Indispensable in wire mills for sampling large wire.

In almost universal use by wire fabricators for cutting reinforcing fabric, fencing, spring wire, etc.

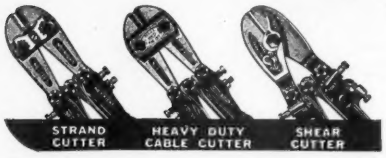
Useful in any plant—large or small—for all sorts of maintenance and repair work—for cutting bolts, rods, wires, rivets, wire rope, chains, or for splitting deformed or "frozen" nuts.

There is a standard Porter tool for every cutting job up to ¾" annealed bolts or ½" hardened chains. Special cutters designed to fit your industry's needs.

Send for Catalog of PORTER CUTTERS.

SEND FOR CATALOG

H. K. PORTER, INC.
EVERETT, MASS.



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"Pic-Kleen" saves time and money in cleaning-house practice by:

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New Catalog on Micromax Electric Control

A NEW, 29-page catalog — "Micromax Electric Control" —has just been issued by **Leeds & Northrup Company.**

✦ ✦ ✦

THOSE faced with an automatic control problem, whether the controlled quantity is temperature, pH, conductivity or per cent SO_2, should be interested in this publication. It describes control equipment capable of handling any process which can be controlled by positioning a valve or other regulating device.

✦ ✦ ✦

DIAGRAMS and text explain how the equipment is adjusted to fit the needs of a particular process. And a number of pictures show the equipment in actual use in a wide variety of applications.

✦ ✦ ✦

ANYONE concerned with automatic control may ask Leeds & Northrup Company, 4934 Stenton Avenue, Philadelphia, Penna., for Catalog N-OOA.

✦ ✦ ✦

Bulletin on Monel

THE Development and Research Division of the International Nickel Company, Inc., 67 Wall Street, New York City, has issued a 16-page bulletin describing the engineering properties of K Monel metal.

✦ ✦ ✦

INFORMATION included covers composition, physical constants, properties, working instructions for pickling and welding, thermal treatment data for softening, hardening, stress relieving and so forth, a table of mill forms and sizes, and a section devoted to applications, i.e., rods, wire and strip applications to springs, ballbearings, washers, chains, bolts, etc. Ask for Bulletin T9.

IT'S ONLY A PIECE OF WIRE

. . . just as it's only a piano — until you hear it — and its true, sweet tone makes you realize it's a Steinway.

. . . and some people may call it just a rhyme — but when you read it, the depth and beauty of its words and meaning tell you it's poetry — by Wordsworth.

It's the same with Callite Wire. Callite is never just any piece of wire — but wire specially fabricated for a specific application. Years of wire making experience assures precision accuracy in size, temper, tolerance and finish.

If you have a wire problem involving close tolerance and fine finish, our engineers will be glad to assist you in determining the proper wire for your requirements.

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Callite Fine Wires in sizes as small as .002" can be furnished in the following metals and alloys for springs, wire forms, instrument shafts, special screw machine applications, control cables, brushes, wire cloth and other special applications.

ALUMINUM • BERYLLIUM COPPER
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LIMITED EDITION

Diamond and Gem Stone Industrial Production

PAUL GRODZINSKI

PRICE $5.00

The use of diamonds and gem stones as dies for fine wire drawing, and of diamonds for cutting tools, is comparatively recent. Today it is extensive and increasing. In this book the author has brought together all the data and information available on the subject and has added the results of his own experience and research. Although dealing mainly with the actual production of the dies and tools, the knowledge this book imparts is of prime importance to tool users. Efficiency and economy in the use of diamond and gem stone dies and tools is not possible without a knowledge of production methods.

✦ ✦ ✦

There are reference tables and a large number of specially drawn illustrations included in this book. An endeavor has been made to leave no phase of the subject untouched.

MAIL YOUR ORDER TODAY

WIRE & WIRE PRODUCTS

300 MAIN ST. STAMFORD, CONN.

Minimizing Rejects

(*Continued from Page 169*)

amount of losses brought about by the return of or the production of defective goods. The problem of actual handling and disposal is however quite different. The continued retention of such classes of material on factory premises or in parts of the warehouse must enforce an augmentation in the rate of depreciation or advancing obsolescence. The obvious move to counter those possibilities is the creation of a centralised defective store. Transfer of defective stocks from production centers will leave those sections provided only with their current requirements and their slow moving stocks and it will mean that the warehouse will carry only those stocks which have a ready saleable value. Concentration of all defective material into one common store contributes in no uncertain manner to the simple compilation at regular intervals of existing values. Statistics thus compiled will prove to be of advantage in demonstrating the tendency of losses brought about by defective work.

✦ ✦ ✦

Disposal of Defective Goods

IT is to the sales department that the onus of disposal of defective stocks will be transferred. The fixing of a price for disposal may present difficulties but these will best be overcome by the convention of a regular monthly meeting of production and sales executives. These executives would, at these meetings, be provided with statistics of defective material available and waiting disposal. Whilst such gatherings will present opportunities for price discussing and price fixing—it being remembered that only a relatively small percentage of the original cost price is likely to be obtainable for faulty reject work — the interchange of ideas and opinions by the sectional authorities may create new suggestions which, with development and research may result in the utilisation of such materials in the course

THOROUGH DEGREASING ASSURES SUPERIOR BLACK FINISHES

THOROUGH surface degreasing is indispensable in securing a **LONG-LASTING** black finish.

This NEW booklet... just off the press... discusses this important requirement in detail. Here are fully described SPECIALIZED Oakite degreasing methods that will HELP YOU get CHEMICALLY CLEAN surfaces on a FAST, TROUBLE-FREE basis... that keep rejects down and production flowing smoothly to meet your urgent war demands! Send for your FREE copy TODAY!

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"Gilron" Coating Compounds increase drawing speed of stainless steel wire considerably. Multiple reductions can be drawn without recoating. Excellent results on welding wire.

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of normal or of especial production in the near future. Time given to such conventions should be amply compensated by the saving which may be made when the results are compared with the 'job' prices usually forthcoming from a dealer in scrap for reject material.

✦ ✦ ✦

A Handbook on Training Employees as Job Instructors

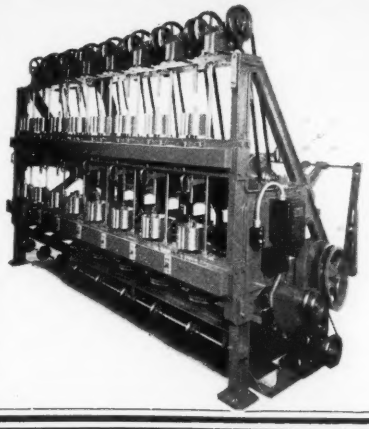
TO provide the executive with a guide for outlining a specific plan and program for training job instructors in his own company, the Metropolitan Life Insurance Company, has issued a report entitled **Training Employees as Job Instructors.**

✦ ✦ ✦

THIS has been published in the form of a handbook in which is discussed such important questions as the selection of job instructors, the time and place for their training, the consequences of inadequate training, the cost of training and other questions of concern to executives. Included also are samples of training programs now in operation in war production industries and many exhibits illustrating the material used in such programs.

✦ ✦ ✦

THE report is based on interviews and correspondence with Federal and State Agencies, consultations with private companies, and the actual training methods used by the author in the plants of several companies. An appendix to the report lists references dealing with the job instructor training activities of some 21 war production companies with thumbnail sketches of the training problems encountered. An executive interested in the subject may obtain a copy of this handbook direct from Policyholders Service Bureau, Metropolitan Life Insurance Company, One Madison Avenue, New York City.



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FOR LINEAR MEASURE
PROVIDES NEW STANDARD OF ACCURACY
Illustration Shows Exclusive Patented "3V" Principle
Measuring twisted, armored, bare or insulated wire without vibration or inaccuracies at any speed or varying speeds!
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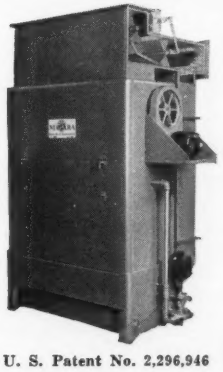

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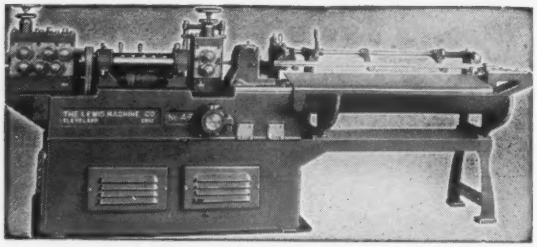

Machines for 1/16" to 3/4" rod

Round
Square
Flat
Hexagon
Ferrous and Non-Ferrous

Automatic
High Speed
Heavy Duty

The Sign of Dependable Service:

WE CAN SUPPLY AND ENGINEER OUR TOOLS EQUIPPED WITH CARBOLOY CEMENTED CARBIDE

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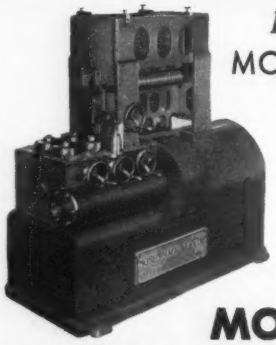

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★ Modernize your welding rod manufacturing equipment by installing a MOSLO AUTOMATIC WIRE FEEDER. The precision and durability of this machine guarantees efficient, economical operation.

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Standard Equipment in War as in Peace

Apco Mossberg Steel Reels are standard throughout the wire industry – and for good reason! Apco Mossberg – the original Frank Mossberg Co. – *originated* the steel reel idea and have been training workmen in their manufacture ever since. That is why Apco Mossberg Steel Reels are preferred where the pressure of wartime production schedules is heaviest.

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We will gladly submit drawings, blueprints, or suggestions without obligation to you. Write for quotation today.

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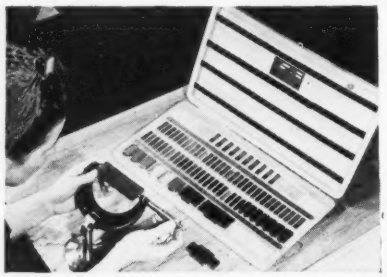
(The Original Frank Mossberg Co.)
21 Lamb Street . . . Attleboro, Mass.

Precision Gage Blocks

DOALL Master Gage Blocks have been announced by the Savage Tool Company, of Savage, Minn.

✦ ✦ ✦

A STANDARD set designated as Set 400, consisting of 81 blocks, is being produced in quantity. The individual blocks range in length from .050″ to 4.00″. These precision gage blocks are produced in "AA" grade (accuracy .000002″), "A" grade (accuracy .000004″), and "B" grade (accuracy .000008″). Each gage block in addition to being extremely accurate in length, has its measuring surface lapped to a flatness of less than the quarter wave length of light, and is produced with a mirror finish. These factors enable the blocks to be used in combination, so that it is possible to secure practically any dimension in steps of .0001″ from .1000″ to 12.00″.



THE illustration shows DOALL Gage Blocks in the case supplied with the gages. The inspector is checking a 4″ micrometer. DOALL Gages are produced by a staff of highly skilled gage makers in the laboratory of the new plant of the Savage Tool Company.

✦ ✦ ✦

PRECISION optical measuring instruments are used to check the accuracy of every gage block produced, and this equipment is also available to users for rechecking their gage blocks after they have been in long use. Used gage blocks sent in are recalibrated and gages that have been worn be-

IMMEDIATE RECOGNITION!

ACCORDED THIS FOUR-STAR BOOK

★ Practical ★ Original ★ Interesting ★ Complete

From all quarters has come commendation of this latest ASM book on practical metallurgy. Already four famous engineering schools—Case School of Applied Science . . . University of Wisconsin . . . Brooklyn Polytechnic Institute . . . Stevens Institute of Technology — are planning to use this book as a textbook for their courses in metallurgy.

Typical of other responses is that from Dr. Zay Jeffries, General Electric authority, who says: "The book constitutes a valuable addition to the literature of metallurgy".

If you haven't ordered your copy, do so today. You'll agree when you receive "Practical Metallurgy" that this is the finest book on this subject available today.

PRACTICAL METALLURGY

Applied Physical Metallurgy — Industrial Processing of Ferrous and Nonferrous Metals and Alloys

by

GEORGE SACHS,
Case School of Applied Science
and
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In addition to 335 general illustrations, PRACTICAL METALLURGY contains 160 constitutional diagrams covering all systems that contain an important commercial alloy. These diagrams . . . the chapters on Plastic Deformation of Ferrous and Nonferrous Metals . . . and the chapter on Internal Stress in Metals contain information not available in any other book published in this country.

Here is the book you've long wanted — a simple yet complete treatise on practical metallurgy.

WIRE & WIRE PRODUCTS
300 Main St. Stamford, Conn.

STEEL WIRE

By MAURICE BONZEL

✦ ✦ ✦

Translated and Published by

Kenneth B. Lewis

Consulting Engineer

✦ ✦ ✦

Price $15.00

✦ ✦ ✦

495 pages—414 illustrations

✦ ✦ ✦

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WIRE and WIRE PRODUCTS

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yond tolerance of the original set replaced to maintain the required standards of accuracy.

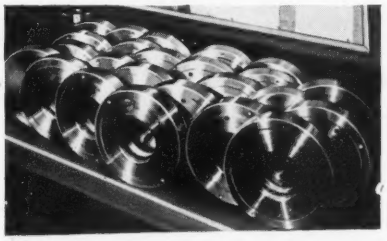
✦ ✦ ✦

IT is said that World War I was fought in thousandths of an inch, while World War II is being fought in tenths of a thousandth. To maintain the accuracy of a tenth or half tenth on the fighting equipment being produced throughout the country, precision gage blocks are of prime importance. The expanded facilities for the production of DOALL Gage Blocks by the Savage Tool Company is making possible prompt shipments.

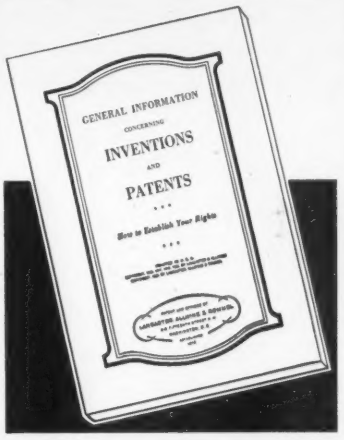
✦ ✦ ✦

They "Pass the Ammunition" Carbide Dies Aid in the Substitution of Steel for Brass

ACCORDING to Army Ordnance 12,600 tons of critical brass is being saved on one contract in the conversion, alone, of 105 mm. shell from brass to steel. This development has been facilitated by the adoption of drawing dies with ex-



tremely hard cemented tungsten carbide centers. Produced by Carboloy Co., Inc., the 6 sets of four dies each in the above photograph will produce an estimated 1,000,000 steel shell cases.



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✦ ✦ ✦

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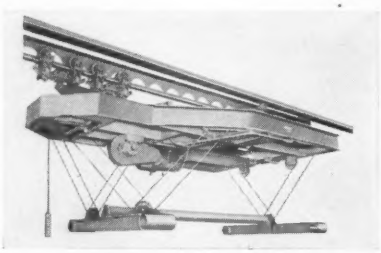

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✦ ✦ ✦

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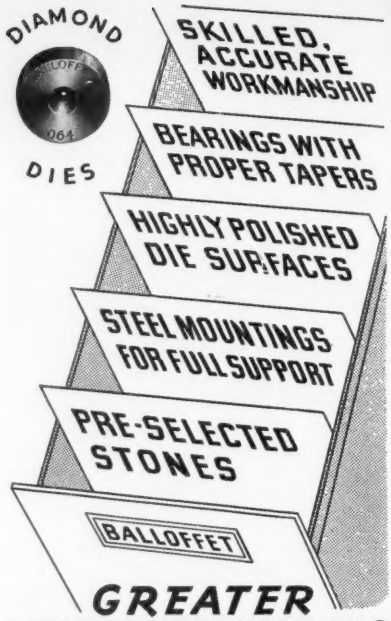

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✦ ✦ ✦

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✦ ✦ ✦

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✦ ✦ ✦

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✦ ✦ ✦

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Firth-Sterling Steel Co., McKeesport, Pa.
Vascoloy-Ramet Corp., North Chicago, Ill.

CUTTING TOOLS—Wire
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Firth-Sterling Steel Co., McKeesport, Pa.
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Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
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Firth-Sterling Steel Co., McKeesport, Pa.
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Rusch Wire Die Corp., New York, N. Y.
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Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

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Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
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Rusch Wire Die Corp., New York, N. Y.
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Standard Machinery Co., Providence, R. I.
Vaughn Machinery Co., Cuyahoga Falls, O.

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Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Automatic
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Brazing
Electric Furnace Co., Salem, O.
Firth-Sterling Steel Co., McKeesport, Pa.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, O.
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Electric
Electric Furnace Co., Salem, Ohio
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio

FURNACES—Hardening & Tempering
Carl-Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio

FURNACES—Lead Melting
Electric Furnace Co., Salem, Ohio
Robertson, John, Co., Brooklyn, N. Y.

FURNACES—Non-Oxidizing
Carl-Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio

FURNACES—Normalizing
Carl-Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio
Rockwell, W. S., Co., New York, N. Y.

FURNACES—Salt Bath
Electric Furnace Co., Salem, Ohio
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.

FURNACES—Wire, Strip & Sheet
Carl-Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio

GALVANIZING EQUIPMENT—
Wilson, Lee, Engr. Co., Cleveland, Ohio

GALVANIZING KETTLES—
National Annealing Box Co., Washington, Penna.

GRINDERS—Roll
Norton Co., Worcester, Mass.

HI-SPEED BAKERS—
Carl-Mayer Corp., The, Cleveland, Ohio

HOISTS—Electric Travelling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

INHIBITORS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Parkin, Wm. M., Co., Pittsburgh, Pa.

KETTLES—Galvanizing, Annealing, Tinning, etc.
National Annealing Box Co., Washington, Penna.

LATHES—Die Reaming
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

LIME—
Warner Co., Philadelphia, Pa.

LUBRICANTS—For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Miller, R. H., Co., Inc., Homer, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

LUBRICANTS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Richards, G. Whitfield, Philadelphia, Pa.
Standard Industrial Compounds Co., Chicago, Ill.

MACHINERY—Armoring (Cable, Wire Hose)
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Robertson, John, Co., Brooklyn, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Braiding
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Watson Machine Co., Paterson, N. J.

MACHINERY—Brazing
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.

MACHINERY—Bunching
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cable, Electric
American Insulating Mach'y. Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Chain Making
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Closing
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coil Winding
Robinson Mfg. Co., Muncy, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Coilers
Broden Construction Co., Cleveland, Ohio
Morgan Construction Co., Worcester, Mass.

WHERE TO BUY, Continued

New England Butt Co., Providence, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Copper Wire Drawing and Rolling
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire
Fidelity Machine Co., Philadelphia, Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Cutting
Broden Construction Co., Cleveland, Ohio
Lewis Machine Co., The, Cleveland, Ohio
Moslo Machinery, Inc., Cleveland, Ohio
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Shuster, F. B., Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Die Making
Firth-Sterling Steel Co., McKeesport, Pa.

MACHINERY — Die Making for Forming Special Shapes
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

MACHINERY—Draw Benches
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Edging
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Enameling
American Insulating Mach'y. Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Extruding
National Erie Corp., Erie, Pa.
Robertson, John, Co., Brooklyn, N. Y.
Royle, John, & Sons, Paterson, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Flat Wire
Broden Construction Co., Cleveland, Ohio
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Forming
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Galvanizing
Broden Construction Co., Cleveland, O.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio

MACHINERY—Galvanizing Wire
Wilson, Lee, Engr. Co., Cleveland, Ohio

MACHINERY—Gang Winders
Fidelity Machine Co., Philadelphia, Pa.
Robinson Mfg. Co., Muncy, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., Worcester, Mass.

MACHINERY—Insulating
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Royle, John, & Sons, Paterson, N. J.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Knitting
Fidelity Machine Co., Philadelphia, Pa.

MACHINERY—Lead Encasing Presses, etc.
Robertson, John, Co., Brooklyn, N. Y.

MACHINERY—Lead Stripping
Robertson, John, Co., Brooklyn, N. Y.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Material Handling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

MACHINERY — Measuring Wire & Cable
Davis, R. L., Electric Co., Wallingford, Conn.
Durant Mfg. Co., Milwaukee, Wis.
Lyon-Vail Machine Co., Brockton, Mass.
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Glader, Wm., Machine Works, Chicago, Ill.
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Panning
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Pointing
Broden Construction Co., Cleveland, Ohio
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Quill Winding
Fidelity Machine Co., Philadelphia, Pa.

MACHINERY—Rod Mill
Broden Construction Co., Cleveland, Ohio
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.

MACHINERY—Rolling Mill
Broden Construction Co., Cleveland, Ohio
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Rubber for Insulating Wire
National Erie Corp., Erie, Pa.
Royle, John, & Sons, Paterson, N. J.

MACHINERY—Rubber Strip Covering
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Rubber Tubing and Straining
New England Butt Co., Providence, R. I.
Royle, John, & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Screw Wire
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y Co., Phila., Pa.
Broden Construction Co., Cleveland, Ohio
Emory, Robert J., Co., Newark, N. J.
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I. (Special Designs)
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spooling
American Insulating Mach'y Co., Phila., Pa.
Emory, Robert J., Co., Newark, N. J.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spring Making
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Broden Construction Co., Cleveland, Ohio
Lewis Machine Co., The, Cleveland, Ohio
Moslo Machinery Co., Cleveland, Ohio
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Ruesch, H. J., Machine Co., Newark, N. J.
Shuster, F. B., Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Stranding
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Broden Construction Co., Cleveland, Ohio
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Swaging
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Testing
Robinson Mfg. Co., Muncy, Pa.
Scott, Henry L., Co., Providence, R. I.

MACHINERY—Testing Size of Wire
Davis, R. L., Electric Co., Wallingford, Conn.

MACHINERY—Testing Spring
Standard Machinery Co., Providence, R. I.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Trolley Wire
Vaughn Machinery Co., Cuyahoga Falls, O.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Tube Mill
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Welding Wire
Micro Products Co., Chicago, Ill.
Shuster, F. B., Co., New Haven, Conn.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Bending
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

MACHINERY—Wire Drawing
American Insulating Mach'y Co., Phila., Pa.
Broden Construction Co., Cleveland, Ohio
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
Robinson Mfg. Co., Muncy, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Wire Measuring
Durant Mfg. Co., Milwaukee, Wis.
Lyon-Vail Machine Co., Inc., Brockton, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

WHERE TO BUY, Continued

MACHINERY—Wire Tinning
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Wood Screw
National Machinery Exchange (Used), New York, N. Y.

MATERIAL HANDLING EQUIPMENT
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

MILLS—Tandem Rolling and Edging
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.

NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip
Hudson Wire Co., Ossining, N. Y.

OILS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Richards, G. Whitfield, Philadelphia, Pa.
Standard Industrial Compounds Co., Chicago, Ill.

OVENS—Cable Lacquering
Industrial Oven Engr. Co., Cleveland, Ohio

OVENS—Industrial
Carl-Mayer Corp., The, Cleveland, Ohio
Industrial Oven Engr. Co., Cleveland, Ohio
Ross, J. O., Engineering Corp., New York, N. Y.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.

PAINTS—Marine
American Chemical Paint Co., Ambler, Pa.

PAINTS—Structural Steel
American Chemical Paint Co., Ambler, Pa.

PANS—Lead and Spelter
National Annealing Box Co., Washington, Penna.

PANS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

PAPER—Creped Wrapping
Crepe-Kraft Co., Newark, N. J.

PAPER TESTERS—
Scott, Henry L., Co., Providence, R. I.

PATENT ATTORNEYS—
Lancaster, Allwine and Rommel, Washington, D. C.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Parkin, Wm. M., Co., Pittsburgh, Pa.

PLASTIC TESTERS—
Scott, Henry L., Co., Providence, R. I.

POTS—Lead Melting
Robertson, John, Co., Brooklyn, N. Y.

POWDER—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Richards, G. Whitfield, Philadelphia, Pa.

PRESSES—Hydraulic and Mechanical
Robertson, John, Co., Brooklyn, N. Y.
Standard Machinery Co., Providence, R. I. (Mechanical Only)

PRESSES—Lead
Robertson, John, Co., Brooklyn, N. Y.

PRESSURE VESSELS—
National Annealing Box Co., Washington, Penna.

PULLERS—Wire
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

PUMPS—Hydraulic
Robertson, John, Co., Brooklyn, N. Y.

QUENCHING BATH CONTROLS—
Niagara Blower Co., Buffalo, N. Y.

REEL AND TENSION STAND—
Fidelity Machine Co., Philadelphia, Pa.
Moslo Machinery Co., Cleveland, Ohio
Robinson Mfg. Co., Muncy, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS—Annealing and Stranding
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B., Co., New Haven, Conn.
Stevens Metal Products Co., Niles, O.

REELS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS AND SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS—Takeoff
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B., Co., New Haven, Conn.
Stevens Metal Products Co., Niles, O.

REELS—Vulcanizing and Impregnating
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B., Co., New Haven, Conn.
Stevens Metal Products Co., Niles, O.

REELS—Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REFRACTORIES—High Temperature
Norton Co., Worcester, Mass.

ROD BAKERS—
Carl-Mayer Corp., The, Cleveland, Ohio
Moslo Machinery Co., Cleveland, Ohio
Ross, J. O., Engineering Corp., New York, N. Y.

RODS—Wire—Non-Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.

ROLL STRAIGHTENERS—
Moslo Machinery Co., Cleveland, Ohio

RUBBER AND RUBBER COMPRESSION TESTERS—
Scott, Henry L., Co., Providence, R. I.

RUST PROOF COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.

RUST REMOVING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.

SHEARS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

SHEET—Steel
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.

SOAPS—Industrial and Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

SPOOLS—Annealing and Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

SPOOLS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

STAMPINGS—Steel
Hubbard Spool Co., Chicago, Ill
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Brass and Non-Ferrous
Hudson Wire Co., Ossining, N. Y.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.

STRIP METAL TESTERS—
Scott, Henry L., Co., Providence, R. I.

SWIFTS—Take-off
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TANKS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.

TEMPERATURE CONTROLS—
Niagara Blower Co., Buffalo, N. Y.

TENSILE TESTERS—
Scott, Henry L., Co., Providence, R. I.

TESTING INSTRUMENTS—
Scott, Henry L., Co., Providence, R. I.

TOOLS—Wire Cutting
Porter, H. K., Inc., Everett, Mass.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

TREADS—Safety
Norton Co., Worcester, Mass.

TRUCKS—
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

TUBE BENDERS AND FORMERS—
Ruesch, H. J., Machine Co., Newark, N. J.

TURKS HEADS—Friction and Power Driven
Standard Machinery Co., Providence, R. I.

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WELDERS—Spot and Butt
Micro Products Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio

WIRE—Cold Heading
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.

WIRE—Electric
Hudson Wire Co., Ossining, N. Y.

WIRE—Enameled for Coils
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.

WIRE—Music
Jersey Steel & Wire Corp., Irvington, N. J.

WIRE—Nickel Silver and Phosphor Bronze
Callite Tungsten Corp., Union City, N. J.
Hudson Wire Co., Ossining, N. Y.

WIRE—Non-Ferrous to Specification for Special Purposes
Callite Tungsten Corp., Union City, N. J.
Hudson Wire Co., Ossining, N. Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Spring
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.

WIRE—Stainless Steel
Callite Tungsten Corp., Union City, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.

WIRE AND STRIP—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE TESTERS—
Scott, Henry L., Co., Providence, R. I.

WIRE, WEAVING—Non-Ferrous
Hudson Wire Co., Ossining, N. Y.

WRAPPING PAPER—Creped
Crepe-Kraft Co., Newark, N. J.

YARN TESTERS—
Scott, Henry L., Co., Providence, R. I.

HUDSON WIRE COMPANY

PRODUCERS OF FINE WIRES IN ALL METALS

FINE BARE WIRES

High Brass, Low Brass, Zinc 99.99+ and High Tensile Zinc, Commercial Bronze, Phosphor Bronze, Pure Tin, Lead, Antimonial Lead, Tinsel Lahns, Silver Plated Copper, False Gold and Copper.

Cadmium, Nickel Silver, 10%, 18% and 30%; Silver Plated Copper, False Gold and Special Brass and Bronze Alloys to Specification, Metallic Fibre for Packing Purposes, Copper, Bronze, Zinc, Lead and Aluminum.

WIRES FOR METAL SPRAYING

Pure Lead, Lead Alloy, Pure Zinc, Zinc Alloy, Copper, Tin, High Brass, Low Brass, Solder Wire, High Conductivity, Electric Wire.

Cadmium, Nickle Silver, (10%, 18%, 30%); Aluminum, Monel Metal, Phosphor Bronze, Pure Nickel, Commercial Bronze.

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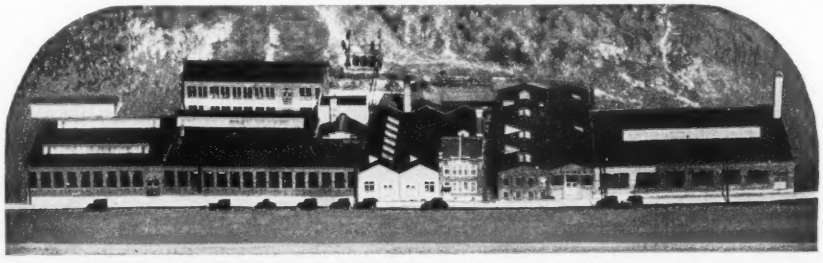

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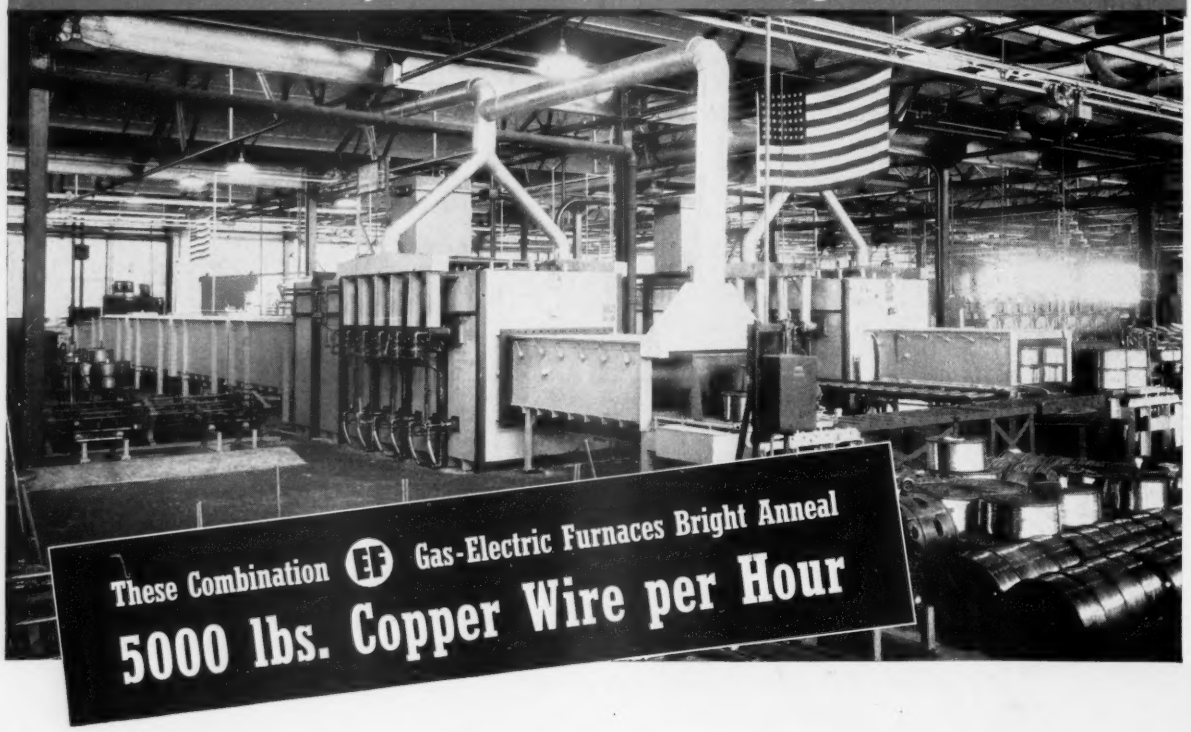

Equipped With

EF Gas-Fired Recuperative Type Radiant Tubes

Bright, uniformly annealed copper wire—at the rate of 2½ tons per hour—is produced continuously in the above combination gas-electric, controlled atmosphere furnace. These furnaces handle rod in coils up to 36" in diameter and wire on reels up to 21" in diameter. The material is carried through the furnaces on bulkhead type trays which provide an effective seal for the protective atmosphere used in the equipment. These trays eliminate the necessity of doors, lock chambers, or other sealing devices at either the charging or discharging ends of the furnaces.

The heating chambers are divided into two separately and automatically controlled zones. The first or charging zone of each furnace is heated by EF gas-fired recuperative type radiant tubes. The soaking zones are heated by heavy V-type cast alloy heating elements.

The heating elements in each zone are located above and below the charge and extend the entire width of the chambers, insuring absolute temperature uniformity throughout the charge.

The protective atmosphere is produced in an EF generator located between the furnaces.

Other recent outstanding production furnace installations include furnaces for bright annealing both ferrous and non-ferrous strip, wire, tubing and other products, . . . furnaces for the production heat treatment of tank armor castings, cartridge cases, shell forgings, bomb and gun parts, machine gun cartridge clips, aircraft and aircraft engine parts, aluminum and magnesium castings, bolts, springs, and many other allied products.

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